SCIENCE ABSTRACTS

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SECTION A.—PHYSICS

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ERRATA.

SECTION A.—PHYSICS.

Abstract No. 1620 (1931), line 8; *for* maximum, *read* minimum, and line 9; *for* minimum *read* maximum.
Abstract No. 470, line 2; *delete* Hestha Ayrton and S. T. Fellow.
Abstract No. 569, line 2; *for* Bicard, *read* Biquard.
Abstract No. 787, line 2; *for* Journ. *read* Rev.
Abstract No. 920, line 1; *for* Calaxies, *read* Galaxies.
Abstract No. 1365, line 1; *for* Comet 1917 II, *read* Comet 1917 I.
Abstract No. 1507, line 1; *for* Anhydrides, *read* Hydrides.
Abstract No. 1766, line 2; *for* electrotypes, *read* electrolytes.
Abstract No. 3825, line 7; *for* 2626 (1933), *read* 2616 (1933).
Abstract No. 4569, line 1; *for* Kollosowsky, *read* Kolossowsky.
Abstract No. 5258, line 3; *for* Abstract 4374 (1933), *read* Abstract 4374 (1932).
Abstract No. 5337, line 13; *for* $[CoCl_4]^{\cdot\cdot}$, *read* $[CoCl_4]''$.

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INDEX.

SECTION A.—PHYSICS

1933

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KEY

TO

SUBJECT INDEX.

The Domain of Physics is divided into eight Main Classes (*e.g.*, **GENERAL PHYSICS**). Each of these Classes is, in general, divided into a number of Sections the titles of which are known as Key-Headings (*e.g.*, **Elasticity and Plasticity**), and these Sections are in turn divided into Sub-Sections under titles known as Sub-Headings (*e.g.*, "Photoelasticity"). The Key-Headings are given below arranged in alphabetical order in their classes, and the scheme of Sub-Headings adopted is indicated in the remainder of the Key.

In the Subject Index the papers are grouped under the Sub-Headings of their appropriate Key-Headings, and these Key-Headings are arranged in alphabetical order throughout the whole Index.

The general form of entry of a paper consists of its full Title, the Author's Name and the Abstract Number assigned to the paper, the sequence of the entries under any Sub-Heading being the order of publication of the Abstracts as indicated by their Abstract Numbers.

For electrical papers of essentially technical interest the reader should refer to "Science Abstracts, Section B.—Electrical Engineering."

GENERAL PHYSICS.

Adsorption.
Atomic and Molecular Structure.
Colloids.
Crystal Structure and Properties.
Density.
Diffusion and Osmosis.
Elasticity and Plasticity.
Gravitation.
Hydrodynamics and Aerodynamics.
Kinetic Theory of Matter.
Length (Standards, Measurements, Apparatus).
Mass (Standards, Measurements, Apparatus).
Mathematical Methods. Theory of Measurements. Units and Dimensions.
Mechanics, Classical.
Mechanics, Quantum.
Relativity and Ether.
Solution.
Surface Tension and Cohesion.
Time (Standards, Measurements, Apparatus).
Vacua, High.
Viscosity. Friction and Lubrication.

ASTRONOMY AND ASTROPHYSICS.

Astronomical Apparatus and Observatory Equipment.
Comets and Meteors.
Cosmogony.
Dynamical Problems (Astronomical).
Latitude and Longitude.
Nebulæ.
Planets.
Stars.
Sun.
Zodiacal Light and Gegenschein.

GEOPHYSICS.

Geodesy.
Geophysics, Applied.
Hydrosphere, Physics of the.
Land, Physics of the.
Meteorology.
Seismology.
Terrestrial Electricity and Magnetism.

RADIOACTIVITY.

All Abstracts relating to this subject are indexed under Radioactivity.

RADIATION.

Absorption and Transmission.
Colorimetry.
Electro-Optical and Magneto-Optical Effects.
Fluorescence and Phosphorescence. Luminescence and Afterglow.
Interference. Diffraction and Scattering.
Photochemistry (including Photography).
Photometry.
Polarisation.
Radiation, Emission.
Radiation, General Theory.
Radiation, Mechanical Effects.
Reflection. Refraction and Dispersion.
Spectroscopy.
Velocity of Light.
Vision.
X-Rays.

HEAT.

Calorimetry.
Conduction.
Convection.
Dilatation.
Melting and Boiling Points.
Temperature, Measurement of.
Thermochemistry.
Thermodynamics.
Vapour Pressure.

ACOUSTICS.

All Abstracts relating to this subject are indexed under Acoustics.

ELECTRICITY AND MAGNETISM.

Alternating-Current Networks.
Conduction and Discharge in Gases.
Conduction in Solids and Liquids.
Dielectrics and Capacitance.
Electrochemistry.
Electrons, Positrons and Protons.
Electrostatics.
Galvanomagnetic and Thermomagnetic Effects.
Magnetism and Electromagnetism.
Medical Radiology and Electrology.
Oscillations.
Photoelectricity.
Piezoelectricity.
Thermionics.
Thermoelectricity.

KEY-HEADINGS WITH SUB-HEADINGS.

Absorption and Transmission (Radiation). Page 1373.

1. Visible Region. Dichroism.
2. Infra-Red Region.
3. Ultra-Violet Region.
4. Apparatus and Technique.
5. Unclassified.

Cross-References :

- Absorption Spectra, *see* Spectroscopy.
- Circular Dichroism, *see* Polarisation (Radiation), 4.
- Cosmic Rays, *see* Radiation, Emission, 5.
- Electric Waves, *see* Radiation, Emission, 4.

Cross-References (contd.) :

- γ-Rays, *see* Radioactivity, 6.
- Meteorological Optics, *see* Meteorology, 6.
- Photodichroism, *see* Photochemistry (including Photography), 2 (*j*.)
- Visibility, *see* Meteorology, 6; *also* Vision, 2.
- X-Ray Absorption, *see* X-Rays, 3 and 8.

Acoustics. Page 1374.

1. Theory of Waves and Vibrations.
2. Plates, Rods and Membranes.
3. Vibrating Columns of Air or other Gases.
4. Strings.
5. Velocity, Measurement of.
6. Propagation in the Atmosphere.
7. Supersonic Vibrations.
8. Architectural Acoustics.
9. Receivers and Reproducers.
10. Speech and Hearing. Noise.
11. Measurements of Absorption, Amplitude, Intensity, Frequency, Wave-Form, Radiation Pressure.
12. Unclassified.

Cross-References :

- Architectural Acoustics, Noise, Receivers and Reproducers, *see also* Section B.—Electrical Engineering.
- Filter Circuits, *see* Alternating-current Networks, 2.

Adsorption. Page 1379.

1. Theory.
2. Adsorption at Interfaces :
   - (*a*) Liquid-Gas.
   - (*b*) Liquid-Liquid.
   - (*c*) Solid-Gas.
   - (*d*) Solid-Liquid.
3. Electrical Phenomena at Interfaces.
4. Apparatus and Technique.
5. Unclassified.

Cross-References :

- Monomolecular Surfaces and Allied Phenomena, *see* Surface Tension and Cohesion, 5.
- *See also* Thermodynamics, 5.

Alternating-Current Networks. Page 1381.

1. Bridges for Measuring Capacitance, Inductance, Frequency and Power Factor.
2. Filter Circuits.
3. Analysis of Non-Electrical Systems into their Equivalent Electrical Circuits.
4. Unclassified.

Cross-References :

- Filter Circuits ; *see also* Section B.—Electrical Engineering.
- Frequency, *see also* Oscillations, Electric, 4.

Astronomical Apparatus and Observatory Equipment. Page 1382.

Atomic and Molecular Structure. Page 1383.

1. Nuclear Constitution.
2. Artificial Disintegration of Elements.
3. Isotopes and Isobares.
4. Neutrons.
5. Periodic System.
6. Arrangement of Orbital Electrons.
7. Valency.
8. Molecular Structure.
9. Association.
10. Atomic and Molecular Magnitudes.
11. Unclassified.

Cross-References :

- Atomic and Molecular Rays, *see* Kinetic Theory of Matter, 3.

Cross-References (contd.) :

- Atomic and Molecular States, *see* Spectroscopy, 2 and 3.
- Critical Potentials, *see* Conduction (Electric) and Discharge in Gases, 5.
- Dipole Moments and Molecular Polarisation, *see* Dielectrics and Capacitance, 2.
- Nuclear Moments, *see* Spectroscopy, 2*g*.
- Ramsauer Effect, *see* Electrons, Positrons and Protons, 3.

Calorimetry. Page 1390.

1. Specific Heat :
    (*a*) Gases and Liquids.
    (*b*) Solids.
2. Latent Heat :
    (*a*) Fusion.
    (*b*) Evaporation.
3. Apparatus and Technique.
4. Unclassified.

Cross-References :
Heat of Adsorption, *see* Adsorption, 2.

Cross-References (contd.) :
Heat of Combustion, *see* Thermochemistry, 2.
Heats of Formation and Dissociation, *see* Thermochemistry, 3.
Heats of Solution and Dilution, *see* Thermochemistry, 1.
Thermodynamics of Specific Heat and Latent Heat, *see* Thermodynamics, 3.

Colloids. Page 1393.

1. Theory.
2. Sols :
    (*a*) Preparation and Chemical Composition.
    (*b*) Electrical Properties (Coagulation, Cataphoresis, Electroosmosis, etc.).
    (*c*) Optical Properties.
    (*d*) Viscosity and Mechanical Properties.
3. Gels :
    (*a*) Formation and Composition.
    (*b*) Optical Properties.
    (*c*) Viscosity and Mechanical Properties.

3. Gels (*contd.*) :
    (*d*) Swelling, Shrinking, Synaeresis.
    (*e*) Structure.
    (*f*) Membranes.
4. Fibres.
5. Emulsions and Suspensions.
6. Apparatus and Technique.
7. Unclassified.

Cross-References :
Adsorption Phenomena, *see* Adsorption.
Brownian Motion, *see* Kinetic Theory of Matter, 5.
Surface Tension Phenomena, *see* Surface Tension.

Colorimetry. Page 1397.

1. Theory.
2. Apparatus and Technique.
3. Unclassified.

Cross-References :
See also Vision, 1 and 2.

Comets and Meteors. Page 1398.

1. Comets :
    (*a*) Orbits.
    (*b*) Spectra.

1. Comets (*contd.*) :
    (*c*) Unclassified.
2. Meteors.

Conduction (Electric) and Discharge in Gases. Page 1399.

1. Theory.
2. Conduction at Higher Pressures (Order of one Atmosphere). Spark and Arc. Mobility of Ions. Recombination of Ions.
3. Low-Pressure Discharge. Theory. Dark Space. Kathode Fall of Potential. Negative Glow. Positive Column. Electrodeless Discharge.
4. Measurement of e/m of Ions.
5. Ionisation by Electron Impact. Critical Potentials.
6. Ionisation by Collision with Atoms and Ions.
7. Ionisation by Chemical Action. Ionisation by Splashing.
8. Positive Rays (Canal Rays). Anode Rays.
9. Kathode Rays. Lenard Rays.
10. Chemical Effects of Discharge.
11. Apparatus and Methods of Measurement.
12. Unclassified.

Cross-References :
Artificial Disintegration of Nuclei, *see* Atomic and Molecular Structure, 2.
Auto-Electronic Emission, *see* Thermionics, 4.
Diffraction, Scattering, Reflection, etc. of Electrons, *see* Electrons, Positrons and Protons, 3.
Electric Breakdown, *see also* Section B.—Electrical Engineering.
Ionic Oscillations, *see* Oscillations, Electric, 1.
Ionisation by α-Rays, *see* Radioactivity, 4.
Ionisation by X-Rays, *see* X-Rays, 3.
Luminous Effects, Radiations, *see* Spectroscopy.
Measurement of e/m of Electrons, *see* Electrons, Positrons and Protons, 2.
Ramsauer Effect, *see* Electrons, Positrons and Protons, 3.
Secondary Electronic Emission, *see* Electrons, Positrons and Protons, 3.

Conduction (Electric) in Solids and Liquids. Page 1407.

1. Theories.
2. Voltage Measurement (Apparatus and Methods).
3. Current Measurement (Apparatus and Methods).
4. Resistance Measurement (Apparatus and Methods).
5. A.C. Resistance, Skin Effect.
6. Effects of Temperature, Pressure and Mechanical Stress on Resistivity.
7. Surface Conduction. Contact Resistance (including Contact Rectifiers).
8. Special Effects (Supraconductivity, etc.).
9. Conductivity:
    (*a*) Metals, Alloys and Non-Metals.

9. Conductivity (*contd.*):
    (*b*) Liquids (including Solutions).
    (*c*) Dielectrics.
10. Unclassified.

Cross-References:
Effect of Magnetic Field on Resistance, *see* Galvanomagnetic and Thermomagnetic Effects.
Photoconductivity, *see* Photoelectricity, 4.
Rectifiers (other than Contact) and Rectification, *see* Oscillations, Electric, 3.
Single Crystals, Conductivity of, *see* Crystal Structure and Properties, 6.
Units of Measurement, *see* Mathematical Methods, etc., 3.

Conduction (Thermal). Page 1414.

1. Theory:
    (*a*) Mechanism of Conduction.
    (*b*) Propagation of Heat in Steady or Variable State.
2. Conductivity Coefficients:
    (*a*) Gases and Liquids.
    (*b*) Solids.
    (*c*) Experimental Methods.
3. Unclassified.

Convection. Page 1415.

1. Free Convection.
2. Forced Convection.
3. Emissivity and Rate of Cooling (including Loss of Heat by Radiation, Conduction and Convection).
4. Unclassified.

Cross-References:
Emissivity (Pure Radiation), *see* Radiation, Emission, 1.

Cosmogony. Page 1416.

Cross-References:
Cosmic Radiation, *see* Radiation, Emission, 5.

Crystal Structure and Properties. Page 1417.

1. General Theory.
2. Crystal Structure:
    (*a*) Metals and Alloys.
    (*b*) Inorganic.
    (*c*) Organic.
    (*d*) Biological.
3. Liquid Crystals.
4. Morphology of Crystals (Crystal Form, Habit, Growth).
5. Optical Properties.
6. Physical Properties (other than Optical).
7. Apparatus and Technique.
8. Unclassified.

Cross-References:
Diffraction and Reflection of Electrons by Crystals, *see* Electrons, Positrons and Protons, 3.
Photoelectric Effects, *see* Photoelectricity, 2.
Piezoelectric Effect, *see* Piezoelectricity.
Reflection of Atoms and Molecules by Crystals, *see* Kinetic Theory of Matter, 3.
X-Ray Diffraction, Reflection, etc., by Crystals, *see* X-Rays.

Density. Page 1427.

1. Density of Gases and Vapours.
2. Density of Liquids.
3. Density of Solids.
4. Apparatus and Technique.
5. Unclassified.

Cross-References:
Earth, *see* Land, Physics of the.

Dielectrics and Capacitance. Page 1429.

1. Theory.
2. Dielectric Constants and Electric (Dipole) Moments :
   (*a*) Solids.
   (*b*) Gases.
   (*c*) Liquids and Colloids.
3. Effects of Electric and Magnetic Fields.
4. Effect of Frequency.
5. Effects of Mechanical Stress, Temperature and Moisture.
6. Dielectric Loss.
7. Capacitance and its Measurement.
8. Unclassified.

Cross-References :
Refractive Index of Dielectrics, *see* Reflection, Refraction and Dispersion, 4.
Electric Breakdown, *see also* Section B.—Electrical Engineering.

Diffusion and Osmosis. Page 1433.

1. Diffusion (General).
2. Osmosis.
3. Membrane Equilibria.
4. Apparatus.

Cross-References :
Association, *see* Atomic and Molecular Structure, 9.
Electroosmosis, *see* Colloids, 2*b*.

Dilatation. Page 1435.

1. Expansion Coefficients :
   (*a*) Gases.
   (*b*) Liquids and Solids.
   (*c*) Experimental Methods.
2. Unclassified.

Cross-References :
Expansion of Rocks, etc., *see* Land, Physics of the, 2 ; *also* Meteorology, 2.

Cross-References (contd.) *:*
Expansion of Sea Water, *see* Hydrosphere, Physics of the, 1.
Thermodynamical Theory, *see* Thermodynamics.

Dynamical Problems (Astronomical). Page 1436.

Cross-References :
General Dynamics, *see* Mechanics, Classical ; *also* Mechanics, Quantum.

Elasticity and Plasticity. Page 1437.

1. Theory.
2. Measurements of Elastic Coefficients.
3. Relations between Elastic Coefficients and other Physical Properties.
4. Plasticity.
5. Photoelasticity.
6. Vibrations and Waves.
7. Strength and Failure Tests.
8. Apparatus and Technique.
9. Unclassified.

Cross-References :
Acoustic Vibrations, *see* Acoustics, 1.
Elasticity of Crystals, *see* Crystal Structure and Properties, 6.
Elastic Properties of Colloids, *see* Colloids, 2*d* and 3*c*.
Piezoelectric Oscillations, *see* Piezoelectricity, 2.
Seismic Effects, *see* Seismology.
V.P.T. Relations, Theoretical, *see* Thermodynamics, 2.

Electrochemistry. Page 1441.

1. Primary and Secondary Cells.
2. Concentration Cells.
3. Electrolysis.
4. Ionic Mobilities and Transport Numbers.
5. Electrode Potentials and Electrode Phenomena.
6. Apparatus and Technique.
7. Unclassified.

Cross-References :
Becquerel Effect, *see* Photoelectricity, 5.
Conductivity of Electrolytes, *see* Conduction (Electric) in Solids and Liquids, 9*b*.

Cross-References (contd.) *:*
Electrocapillary Phenomena, *see* Surface Tension and Cohesion, 6.
Electrokinetic Phenomena, *see* Colloids, 2*b*.
Electrometallurgy, Electroplating and Electrotyping, *see* Section B.—Electrical Engineering.
Photovoltaic Cells, *see* Photoelectricity, 5.
Theories of Solution, *see* Solution, 1.
Thermodynamics of Cells, *see* Thermodynamics, 5 and 6.

Electro-Optical and Magneto-Optical Effects. Page 1446.

1. Double Refraction in Electric or Magnetic Fields.
2. Magnetic Rotation of Plane of Polarisation.
3. Unclassified.

Cross-References :
Photoelasticity, *see* Elasticity and Plasticity, 5.

Cross-References (contd.) *:*
Photoelectric Effect, *see* Photoelectricity.
Photophoresis, Effect of Electric or Magnetic Fields, *see* Radiation, Mechanical Effects, 2.
Stark Effect, *see* Spectroscopy, 7.
Zeeman Effect, *see* Spectroscopy, 6.

Electrons, Positrons and Protons. Page 1448.

1. Constitution.
2. Magnitudes (Charge, Mass, Magnetic Moments, etc.).
3. Collision ; Diffraction, Scattering, Reflection, Absorption.
4. Diffusion.
5. Waves.
6. Unclassified.

Cross-References :
Conduction of Electricity in Metals, *see* Conduction (Electric) in Solids and Liquids, 1.
Conduction of Heat in Metals, *see* Conduction (Thermal), 1.

Cross-References (contd.) *:*
Excitation Potentials, *see* Conduction (Electric) and Discharge in Gases, 5.
Kathode Rays, *see also* Conduction (Electric) and Discharge in Gases, 9.
Neutrons, *see* Atomic and Molecular Structure, 4.
Thermoelectric Effects in Metals, *see* Thermoelectricity, 1.
See also Atomic and Molecular Structure, *also* Radioactivity.

Electrostatics. Page 1452.

1. Theory.
2. Frictional Electricity.
3. Contact Potential.
4. Apparatus.
5. Unclassified.

Cross-References :
Capacitance, *see* Dielectrics and Capacitance, 7.

Cross-References (contd.) *:*
Dielectric Constants, *see* Dielectrics and Capacitance, 2.
Electrode Potentials, *see* Electrochemistry, 5.
Units, *see* Mathematical Methods, etc., 3.

Fluorescence and Phosphorescence. Luminescence and Afterglow. Page 1454.

1. Fluorescence.
2. Phosphorescence.
3. Luminescence and Afterglow.
4. Apparatus and Instruments.
5. Unclassified.

Cross-References :
Fluorescence and Phosphorescence Spectra, *see* Spectroscopy, 5.
See also Zodiacal Light and Gegenschein.

Galvanomagnetic and Thermomagnetic Effects. Page 1456.

1. Galvanomagnetic Effects :
   - (*a*) Hall and Corbino Effects.
   - (*b*) Ettingshausen Effect.
   - (*c*) Change of Resistance in Magnetic Field.
2. Thermomagnetic Effects :
   - (*a*) Nernst Effect.
   - (*b*) Leduc Effect.
3. Unclassified.

Geodesy. Page 1457.

1. Theory.
2. Apparatus and Measurements.

Cross-References :
Isostasy, *see* Gravitation, 2.
See also Latitude and Longitude.

Geophysics, Applied. Page 1457.

1. Surveying and Prospecting:
   (*a*) Electrical Methods.
   (*b*) Magnetic Methods.
   (*c*) Gravitational Methods.
1. Surveying and Prospecting (*contd.*):
   (*d*) Seismic Methods.
2. Unclassified.

Gravitation. Page 1458.

1. General.
2. Terrestrial Gravity.
3. Value of "G."
4. Apparatus and Technique.
5. Unclassified.

Cross-References:
Gravitational Prospecting, *see* Geophysics, Applied, 1*c*.
Pendulums, *see also* Mechanics, Classical, 2.

Hydrodynamics and Aerodynamics. Page 1459.

1. Aerodynamical Theory.
2. Hydrodynamical Theory: Non-Viscous Liquids.
3. Hydrodynamical Theory: Viscous Liquids.
4. Measurement of Fluid Flow.
5. Apparatus and Technique.
6. Unclassified.

Hydrosphere, Physics of the. Page 1462.

1. Thermal Data.
2. Optical Data.
3. Ocean Tides and Currents.
4. Inland Lakes. Rivers.
5. Unclassified.

Interference, Diffraction and Scattering (Radiation). Page 1463.

1. Interference Effects.
2. Interference, Applications.
3. Diffraction.
4. Scattering.
5. Apparatus and Instruments.
6. Unclassified.

Cross-References:
Compton Effect, *see* X-Rays, 2.
Electric Waves, *see* Radiation, Emission, 4.
Meteorological Optics (Corona, Halo, etc.), *see* Meteorology, 6.
Raman Effect, *see* Spectroscopy, 8.

Kinetic Theory of Matter. Page 1466.

1. Gases.
2. Radiometer Effect.
3. Atomic and Molecular Rays.
4. Liquids and Solids.
5. Brownian Motion.
6. Unclassified.

Cross-References:
Electrons, Motion of, *see* Electrons, Positrons and Protons, 3 and 5.
Photophoresis, *see* Radiation, Mechanical Effects of, 2.
V.P.T. Relations, Experimental, *see* Elasticity and Plasticity, 2; Theoretical, *see* Thermodynamics, 2.

Land, Physics of the. Page 1468.

1. Earth's Interior.
2. Thermal Phenomena.
3. Physical Properties of Rocks.
4. Soil Physics.
5. Earth Tides.
6. Unclassified.

Cross-References:
Isostasy, *see* Gravitation, 2.
Lakes, Rivers, Seiches, *see* Hydrosphere, Physics of the, 4.

Latitude and Longitude. Page 1469.

Cross-Reference: See also Geodesy.

Length (Standards, Measurements, Apparatus). Page 1469.

1. Standards.
2. Apparatus and Measurements.

Cross-References:
Variation of Length with Temperature, *see* Dilatation, 1.
Units, *see* Mathematical Methods, etc., 3.

Magnetism and Electromagnetism. Page 1470.

1. Theory.
2. Ferromagnetism.
3. Diamagnetism and Paramagnetism.
4. Electromagnetic Field and Electrodynamics.
5. Electromagnetic Induction. Inductance.
6. Magneto-Mechanical Effects (Gyromagnetic Effect and Magnetostriction).
7. Apparatus and Technique.
8. Unclassified.

Cross-References :
- Earth's Magnetism, *see* Terrestrial Electricity and Magnetism, 2.
- Eddy Currents, *see* Conduction (Electric) in Solids and Liquids, 5.

Cross-References (contd.) *:*
- Effect of Magnetic Field on Resistance, *see* Galvanomagnetic and Thermomagnetic Effects.
- Inductive Networks, *see* Alternating-Current Networks, 1.
- Instruments for Measuring Current, Voltage and Resistance, *see* Conduction (Electric) in Solids and Liquids, 2, 3 and 4.
- Skin Effect, *see* Conduction (Electric) in Solid and Liquids, 5.
- Units, *see* Mathematical Methods, etc., 3.

Mass (Standards, Measurements, Apparatus). Page 1476.

1. Standards.
2. Apparatus and Measurements.

Cross-References :
- Units, *see* Mathematical Methods, etc., 3.

Mathematical Methods. Theory of Measurements. Page 1476. Units and Dimensions.

1. Mathematical Methods.
2. Theory of Measurements, Probability and Errors.
3. Units and Dimensions.
4. Apparatus and Technique.
5. Unclassified.

Mechanics, Classical. Page 1478.

1. Statics.
2. Dynamics.
3. Statistical Mechanics.
4. Apparatus and Measurements.

Cross-References :
- Acceleration due to Gravity, *see* Gravitation, 2.
- Astronomical Dynamics, *see* Dynamical Problems (Astronomical).
- Atomic and Molecular Rays, *see* Kinetic Theory of Matter, 3.

Cross-References (contd.) *:*
- Elastic Vibrations, *see* Elasticity and Plasticity, 6, *and* Acoustics, 1.
- Hydrodynamics and Aerodynamics, *see under.*
- Kinetic Theory, *see* Kinetic Theory of Matter.
- Wave Motion, *see* Elasticity and Plasticity, 6, *and* Seismology.

Mechanics, Quantum. Page 1481.

1. Matrix (or Symbolic) Mechanics.
2. Wave Mechanics.
3. Statistical Mechanics.
4. Experimental Determination of "h."

Cross-References :
- Special Applications, *see* Atomic and Molecular Structure; Electrons, Positrons and Protons; Radiation, General Theory; Radioactivity; Spectroscopy; Thermodynamics; X-Rays.

Medical Radiology and Electrology. Page 1485.

1. Electrobiology.
2. Electrotherapy.
3. Radiography.
4. Radiotherapy :
   - (*a*) Infra-Red Rays.
   - (*b*) Ultra-Violet Rays.

4. Radiotherapy (*contd.*) :
   - (*c*) X-Rays.
   - (*d*) Radioactive Radiations.
5. Unclassified.

Cross-References :
- Industrial Radiography, *see* X-Rays, 11.

Melting and Boiling Points. Page 1488.

1. Melting Points.
2. Boiling Points.
3. Relations of M. Pt. and B. Pt. and other Physical Properties.
4. Liquefaction and Solidification.
5. Evaporation and Condensation.
6. Apparatus and Technique.
7. Unclassified.

Cross-References :
Standard Fixed Points, *see* Temperature, Measurement of, 1.
Thermodynamic Theory, *see* Thermodynamics, 3 and 5.

Meteorology. Page 1490.

1. Constitution of the Atmosphere at Various Levels. The Ozone Layer.
2. Temperature and Radiation.
3. Dynamical Meteorology (Pressure, Wind, Turbulence, Weather Maps and Forecasting).
4. Rain, Snow, Dew, Cloud, Fog, Moisture, Dust.
5. Climatology.
6. Optical Phenomena (Aurora, Night Sky, Corona, Halo, etc.).
7. Meteorological Instruments.
8. Unclassified.

Cross-References :
Aurora, *see also* Terrestrial Electricity and Magnetism, 2.
Cosmic Rays, *see* Radiation, Emission, 5.
Electrical and Magnetic Phenomena, *see* Terrestrial Electricity and Magnetism.
Solar Radiation, *see* Sun, 4.
Visibility, *see also* Vision, 2.

Nebulæ. Page 1494.

1. Galactic.
2. Extra-Galactic.

Oscillations, Electric. Page 1495.

1. Generation.
2. Amplification.
3. Rectification.
4. Measurement of Frequency.
5. Applications.
6. Unclassified.

Cross-References :
Crystal Rectification, *see* Conduction (Electric) in Solids and Liquids, 7.

Cross-References (contd.) *:*
Electric Waves, *see* Radiation, Emission, 4.
Frequency, *see also* Alternating-Current Networks, 1.
Piezoelectric Oscillations, *see* Piezoelectricity, 2.
See also Section B.—Electrical Engineering.

Photochemistry (including Photography). Page 1496.

1. General.
2. Photography :
   - (*a*) Theory.
   - (*b*) Contrast, Gradation and Density.
   - (*c*) Development, Fixation, Reduction, Intensification, Toning, Washing, Drying.
   - (*d*) Sensitivity, Sensitisation, Desensitisation, Sensitive Material, Sensitometry.
   - (*e*) Emulsions and Emulsion Processes.
   - (*f*) Latent Image, Print-Out Effect, Herschel and Villard Effects.
   - (*g*) Kinematography and Colour Photography.
   - (*h*) Applications. Industrial Reproduction.

2. Photography (*contd.*) :
   - (*i*) Apparatus, Instruments and Photographic Light Sources.
   - (*j*) Unclassified.

Cross-References :
Becquerel Effect, *see* Photoelectricity, 5.
Fluorescence Spectra, *see* Spectroscopy, 5.
Photographic Photometry, *see* Photometry, 3.
Photovoltaic Cells, *see* Photoelectricity, 5.
Stellar Photography, *see* Stars, 9.
X-Ray Photography, *see* X-Rays, 4.

Photoelectricity. Page 1500.

1. Photoelectric Emission (General Theory).
2. Photoelectric Emission (Special Substances).
3. Photoelectric Cells (Emission).
4. Photoconductive Cells. Photoconductivity.
5. Photovoltaic Cells. Becquerel Effect.
6. Applications.
7. Unclassified.

Cross-References :
Photoelectric Photometry, *see* Photometry, 3.
Theory of Conduction in Metals, *see* Conduction (Electric) in Solids and Liquids, 1.

Photometry. Page 1504.

1. Theory.
2. Visual Methods.
3. Physical Methods.
4. Spectrophotometry.
5. Standards, Units.
6. Unclassified.

Cross-References :
Colour Measurement, *see* Colorimetry.
Reflecting Power, *see* Reflection, Refraction and Dispersion, 1.
Stellar Photometry, *see* Stars, 1, 3, 4.
X-Ray Photometry, *see* X-Rays, 10.

Piezoelectricity. Page 1506.

1. Statical Phenomena.
2. Piezoelectric Oscillations.
3. Pyroelectricity.

Cross-References :
See also Section B.—Electrical Engineering.

Planets. Page 1507.

1. General.
2. Major Planets.
3. Asteroids (Minor Planets).
4. Satellites (Moon, etc.).
5. Unclassified.

Cross-References :
See also Latitude and Longitude.

Polarisation (Radiation). Page 1508.

1. Polarisation by Reflection.
2. Polarisation by Refraction.
3. Polarisation of Scattered Radiation.
4. Rotation of Plane of Polarisation. Rotatory Dispersion. Circular Dichroism.
5. Apparatus and Technique.
6. Unclassified.

Cross-References :
Dichroism, *see* Absorption and Transmission, 1.

Cross-References (contd.) *:*
Effect of Electric and Magnetic Fields, *see* Electro-Optical and Magneto-Optical Effects, 1 and 2.
Photodichroism, *see* Photochemistry (including Photography), 2 (*j*).
Photoelastic Measurements, *see* Elasticity and Plasticity, 5.
Polarisation of Electric Waves, *see* Radiation, Emission, 4.

Radiation, Emission. Page 1509.

1. Black-Body Radiation. Total Intensity and Spectral Distribution (Theoretical and Experimental).
2. Selective Radiation, Visible and Ultra-Violet Region.
3. Selective Radiation, Infra-Red Region.
4. Electric Waves :
    (*a*) General.
    (*b*) In Ionosphere.
5. Cosmic Rays.
6. Sources of Radiation (All Types).
7. Unclassified.

Cross-References :
Emissivity and Rate of Cooling by Combined Convection, Conduction and Radiation, *see* Convection of Heat, 3.
γ-Rays, *see* Radioactivity, 6.
Radio Communication, *see* Section B.—Electrical Engineering.
Solar Radiation, *see* Sun, 4.
Therapeutic Effects, *see* Medical Radiology and Electrology, 4.
X-Rays, *see* X-Rays, 1.

Radiation, General Theory. Page 1512.

1. Classical Theory.
2. Quantum Theory.

Radiation, Mechanical Effects. Page 1513.

1. Radiation Pressure.
2. Photophoresis.

Cross-References :
Radiometer Effect, *see* Kinetic Theory of Matter, 2.

Radioactivity. Page 1513.

1. Theory.
2. Radioactive Substances and Transformations.
3. Radioactive Chemistry. Preparation and Measurement of Active Sources.
4. α-Rays.
5. β-Rays.
6. γ-Rays.
7. Apparatus and Methods of Measurement.
8. Unclassified.

Cross-References :
Artificial Disintegration of Nuclei, *see* Atomic and Molecular Structure, 2.
Cosmic Radiation, *see* Radiation, Emission, 5.
Isotopes, *see* Atomic and Molecular Structure, 3.
Neutrons, *see* Atomic and Molecular Structure, 4.
Positrons, *see* Electrons, Positrons, and Protons.

Reflection, Refraction and Dispersion (Radiation). Page 1517.

1. Reflection, Reflecting Power.
2. Geometrical Optics. Optical Imagery.
3. Aberration (Spherical and Chromatic), Tests for Definition, Distortion, Astigmatism, etc.
4. Refraction and Refractive Indices.
5. Dispersion.
6. Glasses, Optical Media and Materials.
7. Apparatus and Instruments.
    (*a*) Mirrors, Microscopes and Telescopes.
    (*b*) Refractometers.
    (*c*) Goniometers.
    (*d*) Projectors (Lighthouses, Lanterns, etc.).
    (*e*) Lenses, Objectives, Prisms, Eyepieces.
    (*f*) Unclassified.
8. Unclassified.

Cross-References :
Double Refraction in Magnetic and Electric Fields, *see* Electro-Optical and Magneto-Optical Effects, 1.
Electric Waves, *see* Radiation, Emission, 4.
γ-Rays, *see* Radioactivity, 6.
Meteorological Optics, *see* Meteorology, 6.
Photoelastic Measurements, *see* Elasticity and Plasticity, 5.
Spectrophotometers, *see* Photometry, 4.
Spectroscopic Apparatus, *see* Spectroscopy, 9.
X-Ray Reflection, etc., *see* X-Rays, 5.

Relativity and Ether. Page 1522.

1. Special (or Restricted) Theory of Relativity.
2. General Theory of Relativity.
3. Unitary Field Theory.
4. Unclassified.

Cross-Reference :
Cosmology, *see* Cosmogony.

Seismology. Page 1524.

1. Theory.
2. Observational.
3. Apparatus and Technique.

Cross-References :
Earth Tides, *see* Land, Physics of the, 5.

Solution. Page 1525.

1. Theory.
2. Solubility.
3. Apparatus and Technique.
4. Unclassified.

Cross-References :
General Properties of Solutions, *see* Appropriate Key-Headings (*e.g.*, Viscosity, Conduction (Electric) in Solids and Liquids, etc.).

Cross-References (contd.) *:*
Heats of Solution, *see* Thermochemistry, 1.
Surface Phenomena, *see* Adsorption, *also* Surface Tension and Cohesion.
Thermodynamical Effects, *see* Thermodynamics.

Spectroscopy. Page 1527.

1. Measurements of Wave-Length.
2. Line Spectra:
   - (*a*) Line Emission in Infra-Red.
   - (*b*) Line Emission in Visible and Ultra-Violet.
   - (*c*) Line Absorption in Infra-Red.
   - (*d*) Line Absorption in Visible and Ultra-Violet.
   - (*e*) Analysis of Line Spectra.
   - (*f*) Photometric Intensities and Contours of Lines.
   - (*g*) Hyperfine Structure and Nuclear Moments.
   - (*h*) Theoretical Papers on Line Spectra.
3. Band Spectra:
   - (*a*) Emission Bands in Infra-Red.
   - (*b*) Emission Bands in Visible and Ultra-Violet.
   - (*c*) Absorption Bands in Infra-Red.
   - (*d*) Absorption Bands in Visible and Ultra-Violet.
   - (*e*) Analysis of Band Spectra.
   - (*f*) Intensities in Band Spectra.
   - (*g*) Theoretical Papers on Band Spectra.
4. Continuous Spectra:
   - (*a*) Continuous Emission.
   - (*b*) Continuous Absorption.
5. Fluorescence and Phosphorescence Spectra.
6. Zeeman Effect.
7. Stark Effect.
8. Raman Effect:
   - (*a*) Gases and Vapours.
   - (*b*) Liquids.
   - (*c*) Solids.
9. Instruments and Apparatus.
10. Unclassified.

Cross-References:
Absorption, *see also* Absorption and Transmission (Radiation).
Critical Potentials, *see* Conduction (Electric) and Discharge in Gases, 5.
Fluorescence and Phosphorescence, *see also* Fluorescence, Phosphorescence, Luminescence and Afterglow.
Solar Spectrum, *see* Sun, 6.
Stellar Spectra, *see* Stars, 3.
X-Ray Spectra, *see* X-Rays, 6, 7 and 8.

Stars. Page 1544.

1. Parallax, Magnitudes, Diameter, Mass, Density.
2. Motions.
3. Spectra.
4. Temperature.
5. Constitution and Evolution.
6. Galactic System.
7. Star Clusters and Clouds.
8. Variable Stars, Binaries and Novae.
9. Catalogues and Stellar Photography.
10. Unclassified.

Sun. Page 1548.

1. Chromosphere and Prominences.
2. Corona. Eclipse.
3. Sunspots and Faculæ.
4. Temperature, Radiation and Solar Constant.
5. Parallax, Size, Motion.
6. Spectrum.
7. Magnetism.
8. Unclassified.

Surface Tension and Cohesion. Page 1551.

1. Cohesion.
2. Surface Tension Theory.
3. Determination of Capillary Constants.
4. Relation between Capillary Constants and Other Properties. Parachor.
5. Films.
6. Electrocapillary Phenomena.
7. Apparatus and Technique.
8. Unclassified.

Cross-References:
For further papers on Surface Phenomena, *see* Adsorption.
For further papers on Cohesion *see* Thermodynamics, 2.

Temperature, Measurement of. Page 1554.

1. Scales and Standard Temperatures.
2. Thermometers (other than Electrical).
3. Thermometers and Pyrometers (Electrical).
4. Pyrometers (Optical and Total Radiation).
5. Accessories for Temperature Measurement and Control.
6. Unclassified.

Cross-References:
Flame, Ignition, Explosion Temperatures, *see* Thermochemistry, 4.
Temperature of Earth, Air, Sea, *see* Land, Physics of the, 2; Meteorology, 2; Hydrosphere, Physics of the, 1.

Terrestrial Electricity and Magnetism. Page 1555.

1. Atmospheric Electricity. Ionosphere. Lightning.
2. Earth's Magnetic Field, and Variations of. Aurora.
3. Earth Currents.
4. Unclassified.

Cross-References :
Cosmic Rays, *see* Radiation, Emission, 5.
Electric Wave Propagation, *see* Radiation, Emission, 4, *also* Section B.—Electrical Engineering.
Magnetism of Rocks, *see* Geophysics, Applied, 1 ; *also* Land, Physics of the, 3.

Thermionics. Page 1558.

1. Theory.
2. Measurement of Work Function and Other Emission Constants.
3. Effect of Surface Layers.
4. Effect of Intense Fields (Auto-Electronic Effect).
5. Emission of Positive Ions.
6. Conduction in Flames.
7. Unclassified.

Cross-References :
Valves, Uses of, *see* Oscillations, Electric.

Thermochemistry. Page 1560.

1. Heats of Solution and Dilution.
2. Heat of Combustion.
3. Heats of Formation and Dissociation.
4. Flames, Ignition, Explosion.
5. Effect of Temperature on Chemical Processes and Equilibria.
6. Apparatus and Technique.
7. Unclassified.

Cross-References :
Conduction in Flames, *see* Thermionics, 6.
Heat of Adsorption, *see* Adsorption, 2.
Thermodynamics of Chemical Processes, *see* Thermodynamics, 6.

Thermodynamics. Page 1563.

1. Fundamental Principles (1st and 2nd Laws). Determination of Mechanical Equivalent of Heat.
2. Equations of State and Critical Phenomena.
3. Application to Specific Heats and Latent Heats.
4. Phase Rule and Applications.
5. Measurements of and Formulæ for Entropy, Internal Energy, Total Heat (Enthalpy), Free Energy (Thermodynamic Potential at Constant Volume and Temperature), Gibbs' Function (Phase Potential, Thermodynamic Potential at Constant Pressure and Temperature), etc.
6. Thermodynamics of Chemical Processes.
7. Irreversible Phenomena.
8. Unclassified.

Cross-References :
Absolute Scale of Temperature, *see* Temperature, Measurement of, 1.
Kinetic Theory, *see* Kinetic Theory of Matter.
V.P.T. Relations, Experimental, *see* Elasticity and Plasticity, 2.

Thermoelectricity. Page 1568.

1. Theory.
2. Measurement of Thermoelectric Power, Peltier Coefficient, Thomson Coefficient.
3. Unclassified.

Cross-References :
Thermoelectric Measurement of Temperature, *see* Temperature, Measurement of, 3.

Time (Standards, Measurements, Apparatus). Page 1569.

1. Solar and Stellar Time.
2. Secondary Standards, Apparatus and Measurements.
3. Unclassified.

Cross-References :
Pendulums, *see also* Mechanics, Classical, 2.
Units, *see* Mathematical Methods, etc., 3.

Vacua, High. Page 1569.

1. Production.
2. Measurement.
3. Unclassified.

Vapour Pressure. Page 1570.

1. Observational.
   (*a*) Saturated Vapour.
   (*b*) Unsaturated Vapour.
2. Apparatus and Technique.
3. Unclassified.

Cross-References :
Hygrometers, *see* Meteorology, 7.
Rate of Evaporation, *see* Melting and Boiling Points, 5.
Theory, *see* Thermodynamics, 2 and 3.

Velocity of Light. Page 1571.

Cross-References :
Theory, *see* Radiation, General Theory; *also* Relativity and Ether.

Viscosity. Friction and Lubrication. Page 1571.

1. Theory.
2. Measurement of Viscosity.
3. Relations between Viscosity and Other Properties.
4. Lubrication.
5. Friction of Solids (Internal and External).
6. Apparatus and Technique.
7. Unclassified.

Cross-References :
Lubrication, *see also* Section B.—Electrical Engineering.
Viscosity of Colloids, *see* Colloids, 2*d* and 3*c*.

Vision. Page 1574.

1. Theories of Vision.
2. Phenomena of Vision.
3. Optics of the Eye.

Cross-References :
Measurement of Colour, *see* Colorimetry, 2.
Visibility, *see also* Meteorology, 6.

X-Rays. Page 1575.

1. Methods of Production, Apparatus and Instruments for; Phenomena of the X-Ray Tube.
2. Scattering, including Compton Effect.
3. Absorption and Ionisation.
4. Chemical and Photographic Action.
5. Reflection and Refraction.
6. Line Spectra, Emission.
7. Continuous Spectra, Emission.
8. Absorption Spectra.
9. Diffraction.
10. Measurements of Intensity, Equality, Wave-Length, etc.
11. Applications (Industrial Radiography, and Chemical Analysis).
12. Apparatus for X-Ray Spectroscopy.
13. Unclassified.

Cross-References :
Constitution of Atoms and Molecules, *see* Atomic and Molecular Structure.
Photoelectric Emission by X-Rays, *see* Photoelectricity, 1 and 2.
Polarisation of X-Rays, *see under* Polarisation (Radiation), 3.
Radiography (Medical) and Radiotherapy, *see* Medical Radiology and Electrology.
Structure of Crystals, *see* Crystal Structure and Properties.

Zodiacal Light and Gegenschein. Page 1580.

SUBJECT INDEX.

Absorption and Transmission (Radiation).

1. Visible Region. Dichroism.
2. Infra-Red Region.
3. Ultra-Violet Region.
4. Apparatus and Technique.
5. Unclassified.

Cross-References :
Absorption Spectra, *see* Spectroscopy.
Circular Dichroism, *see* Polarisation (Radiation), 4.
Cosmic Rays, *see* Radiation, Emission, 5.

Cross-References (contd.) :
Electric Waves, *see* Radiation, Emission, 4.
γ-Rays, *see* Radioactivity, 6.
Meteorological Optics, *see* Meteorology, 6.
Photodichroism, *see* Photochemistry (including Photography), 2 (j).
Visibility, *see* Meteorology, 6 ; *also* Vision, 2.
X-Ray Absorption, *see* X-Rays, 3 and 8.

1. Visible Region. Dichroism.

Abstract Nos.

Visual Spectroscopic Method in Heterochromatic Pyrometry. L. S. Ornstein, (Miss), J. G. Eymers and D. Vermeulen 293
Optical Transmission of Cu_2O in Relation to its Electrical Conductivity. G. Mönch 559
Colours of Inorganic Salts. M. N. Saha and S. C. Deb 560
Optical Constants of Transparent Silver. H. Murmann 1425
Natural Blue Rock-Salt. K. Przibram 2342
Recrystallisation and Coloration. Parts III and IV. K. Przibram .. 2343, 5261
Absorption of Metals in the Visible and Ultra-Violet. H. Fröhlich 2344
Transmission of Light through Cloud Particles. D. Nukiyama and A. Kobayasi 2345
Transversal Magneto-Optical Anistropy of Vanadium Pentoxide Sols. W. Heller and H. Zocher 2351
Measurement of the Transmission Factors of Coloured Filters used in Heterchromatic Photometry. G. Ribaud 2377
Position of the Absorption Spectra of Photochemically-Coloured Alkali Halogen Crystals. H. Fröhlich 2434
Continuous Absorption of Oxygen Between 1750 and 1300 Å and Its Bearing Upon the Dispersion. R. Ladenburg and C. C. van Voorhis 2438
Absorption of Light by Solutions of Cobalt Chloride. S. B. Schwezow and A. M. Tanchilewitsch 2934
Light Intensity at Different Depths in Lake Water. H. A. Erikson 2935
Alkali Tartrate Solutions Containing Chromium. J. P. Mathieu 2977
Reflective Power and Bireflection of Nickel Arsenide. W. Faber 2997
Optical Absorption in Radiating Substances by the Alternating Light Method. F. G. Houtermans 3480
Studies in Refractive Index. Parts I and II. A. M. Taylor and A. M. Glover. Part III. A. M. Taylor and Dorothy A. Durfee. Part IV. A. M. Taylor and A. King 3528, 4083, 4488
Absorption Bands and Dispersion of Potassium Chloride. P. Wulff 3529
Dispersion in the Visible and Ultra-Violet. P. Wulff 3530
Transmission of Light through Fog. F. Born, W. Dziobek and M. Wolff 4014
Pleochroism and Birefringence of the NO_3' Ion in Crystals. K. S. Krishnan and A. C. Dasgupta 4455
Scattering and Absorption of Electromagnetic Radiation by a Small Sphere. G. Beck and P. Wenzel 4465
Solarisation of Glass by Soft X-Rays. H. Kersten and C. H. Dwight 4554
Complex Indicatrix of Weakly Absorbing Rhombic Crystals. M. Berek and F. Strieder 4747
Light Penetration in the Waters of the San Juan Archipelago. C. L. Utterback and J. W. Boyle 4816
Light Penetration in the Waters of Southern Alaska. C. L. Utterback 4817
Colouring and Decolouring of Compressed Rock-Salt. Magdalene Haberfeld 4864
Colour Centres in Alkali Halide Crystals. E. Mollwo 4865
Photometric Measurements with Gas-Filled Photoelectric Cells. T. D. Gheorghiu 4893
Additive Colour Effects of Alkali Halide Crystals. Part III. E. Rexer 5131

***See also* 2346 *under* 2.**

For the **Key** to this Index see pp. 1358 to 1372.

Absorption and Transmission (Radiation), *continued.*

2. Infra-Red Region.

Abstract Nos.

Metallic Films and Surfaces. K. Richter 843
Behaviour of Electrons in Nitrous Oxide. V. A. Bailey and J. B. Rudd 1160
Pleochroism of Calcite in the Infra-Red. P. le Roux 1845
Infra-Red Content of Daylight. G. B. Harrison 2346
Transmission of Light by a Flexible Unit of Quartz. H. Dejust and E. Perrin 3242
Transmission of the Infra-Red Radiation Through the Horny Layer of Human Skin. A. R. Pearson and R. E. Norris 4689
Optical Properties of Metallic and Crystalline Powders. A. H. Pfund 4866
Transmission of Infra-Red Radiation by a Thin Layer of Horn. H. J. Taylor 5262
See also 2438, 4554 *under* 1; 997, 3422 *under* 4.

3. Ultra-Violet Region.

Absorption and Dispersion of Celluloid between 300 and 1000 Å. H. M. O'Bryan 995
Absorption of Light by Adsorbed Iodine. J. H. de Boer and J. F. H. Custers 2936
Purification and Ultra-Violet Transmission of Ethyl Alcohol. L. Harris 3477
Ultra-Violet Transmission of Alkali-Beryllium-Borate Glasses. W. Ziegler and Marianne Wellmann 4046
Comparison of the Transmission Bands of Metallic Silver and Colloidal Silver. P. Maréchal 4047
Ultra-Violet Rays in Industry. M. J. Dorcas 4278
Remarkable Optical Properties of the Alkali Metals. R. W. Wood 4456
External Photoelectric Effect in Alkali Halides. R. Fleischmann 4701
See also 2344, 2438, 3529, 3530, 4068, 4554 *under* 1; 996, 997, 3478, 3479 *under* 4.

4. Apparatus and Technique.

Coloured Filter for Optical Pyrometers. I. Peychès 653
Christiansen Filter for Ultra-Violet Radiation. H. Kohn and K. v. Fragstein 996
Spectral Transmission of Filters for Actinometers, Photoelectric Cells and Photometers. K. Büttner and E. Sutter 997
New Monochromatic Radiator. K. Wernicke 1020
Measurement of Visibility at Night. W. E. K. Middleton 1388
Colour Filters for Altering Colour Temperature. Pyrometer Absorption and "Daylite" Glasses. H. P. Gage 1867
Probability and the Exponential Laws of Physics. M. C. Holmes 2204
Registrations with Ångstrom's Pyranometer. Parts I and II. E. Hasché .. 3422
Christiansen Filter for Ultra-Violet Light. K. v. Fragstein 3478
Silver Filter for Ultra-Violet Light. G. C. Brock 3479
Photoelectric Comparator for Rapid Measurement of Reflection and Transmission. C. H. Sharp and H. J. Eckweiler 3509
Source of Error in Measurement of Transmission of Optical Instruments. B. Cuny 4913
Intensity Filter for Hg Line 253.7 $m\mu$. H. W. Melville and H. J. Walls 5263
See also 2377, 2934, 3480, 4014, 4747 *under* 1; 2346, 3242 *under* 2; 2936, 4047 *under* 3.

Acoustics.

1. Theory of Waves and Vibrations.
2. Plates, Rods and Membranes.
3. Vibrating Columns of Air or other Gases.
4. Strings.
5. Velocity, Measurement of.
6. Propagation in the Atmosphere.
7. Supersonic Vibrations.
8. Architectural Acoustics.
9. Receivers and Reproducers.
10. Speech and Hearing. Noise.
11. Measurements of Absorption, Amplitude, Intensity, Frequency, Wave-Form, Radiation Pressure.
12. Unclassified.

Cross-References:
Architectural Acoustics, Noise, Receivers and Reproducers, *see also* Section B.—Electrical Engineering.
Filter Circuits, *see* Alternating-current Networks, 2.

1. Theory of Waves and Vibrations.

Reflection of a Sound Wave from a Circular Plate. M. Sasao 674
Theory of Acoustic Filtration in Solid Rods. R. B. Lindsay and F. E. White 675

Acoustics, ***continued.***

Abstract Nos.

Parabolic Surface in Acoustics. Y. Rocard **1137**
Velocity of Sound in An Absorptive Gas. D. G. Bourgin **1138**
Passage of Sound Waves through Anisotropic Media. G. V. Békésy **1139**
Distribution of Sound from Sources in the Neighbourhood of Plane Reflectors. F. A. Fischer **1970**
Sound Absorption in Multiatomic Gases. H. O. Kneser **1971**
Theory of Dispersion of Sound. A. J. Rutgers and H. O. Kneser **1972**
Null Lines in a Single-Wave Sound Field. P. C. Hermann **2514**
Diffraction of Sound-Waves by a Cylindrical Obstacle. T. Kuyama **4987**
See also 4600 *under* 6; 312, 3713 *under* 7; 3718, 4175 *under* 8.

2. Plates, Rods and Membranes.

Accession to Inertia of Flexible Discs Vibrating in a Fluid. N. W. McLachlan **308**
Axial Sound-Pressure Due to Diaphragms with Nodal Lines. N. W. McLachlan **309**
Electrodynamic Membrane "Drive." H. Benecke **310**
Modes of Vibration of a Conical Membrane. H. Benecke **311**
Measurements with Rayleigh Discs. P. Kotowski **676**
Theory of Vibration of Japanese Hanging Bells. K. Yamashita **686**
Distribution of Sound Radiation from a Sphere Vibrating in Various Ways. Applications to Loud-Speaker Diaphragms. N. W. McLachlan **1140**
Acoustic and Inertia Pressure at any point on a Vibrating Circular Disc. N. W. McLachlan **1141**
Distribution of Sound from Vibrating Flexible Discs with Nodal Lines. N. W. McLachlan **1142**
Power Radiated from Vibrating Flexible Discs with Nodal Lines. N. W. McLachlan **1143**
Diagonal Symmetry in a Chladni Plate. R. C. Colwell **1973**
Vibrations of a Chladni Plate. R. C. Colwell **1974**
Problem Relating to Theory of the Rayleigh Disc. M. Kotani **2504**
Action of An Air Cushion and Absorbing Wall on a Telephone Membrane. K. Schuster and A. Hohberg **2505**
Improvement in the Operation of the Bells of a Carillon. G. M. Giannini **2518**
Sound Emission from Vibrating Membranes. M. Sasao **3123**
Vibration of a Circular Elastic Plate under Tension. W. G. Bickley **3124**
Component Tones from a Bell. A. T. Jones and G. W. Alderman **3726**
Amplitude and Phase of Octave in Tuning Forks. B. Derjaguin **4176**
Free Vibrations of Conical Shell. M. J. O. Strutt **4597**
Radical Vibrations of Aluminium Cones. A. T. van Urk and G. B. Hut **4598**
Strike Note of Bells. E. Meyer and J. Klaes **4988**
Vibrations of Pianoforte Sound-Board. L. D. Mahajan **4990**
See also 674, 675 *under* 1; 1149 *under* 9; 3130 *under* 11.

3. Vibrating Columns of Air or other Gases.

Sensitive Flames. H. Zickendraht **682**
Propagation of Sound Waves of Finite Amplitude. Y. Rocard **1570**
Sensitive Flames. J. Zahradniček **1975**
Tone Formation in Lipped Pipes. J. Zahradniček **4599**
Resonance in Coupled Pipes. A. E. Bate **4989**
See also 5388 *under* 10; 4189 *under* 11.

4. Strings.

Struck String. H. G. Mohamed **2506**
Struck String. M. Ghosh **2507**
Theory of Pianoforte. S. Sawade **4991**
See also 675 *under* 1; 4990 *under* 2.

5. Velocity, Measurement of.

Temperature of the Auroral Region Determined by the Rotational Series of the Negative Nitrogen Bands. L. Vegard **152**
Effect of Humidity on the Velocity of Supersonic Waves in Air. M. Kinoshita and C. Ishii **313**
Dispersion of Sound in Nitrogen Tetroxide. W. T. Richards and J. A. Reid **1571**
Sonic Measurement of Rate of Dissociation of Nitrogen Tetroxide. C. E. Teeter, Jr. **2508**

Acoustics, *continued.*

Abstract Nos.

Velocity of Sound at Low Temperatures. A. van Itterbeek 4177
Velocity of Sound in Air. M. Grabau 4178
Velocity of Sound in Gases in Tubes. G. W. C. Kaye and G. G. Sherratt 4179
See also 1138 *under* 1 ; 314, 677 *under* 7 ; 877 *under* 11.

6. Propagation in the Atmosphere.

Brief Review of the Physics of the Upper Atmosphere. J. Bartels 959
Air Waves from Experimental Explosions 1144
Physics in Meteorology. G. C. Simpson 1387
Air Waves from Experimental Explosions. F. J. W. Whipple 1976
Acoustical Properties of Parabolic Reflectors. K. Satô and M. Sasao 2509
Temperature of the Atmosphere at Levels Accessible to Air-Waves. F. J. W. Whipple 2894
Absorption of Sound in the Atmosphere. Y. Rocard 3125
Meteorological Acoustics. W. S. Tucker 4180
Velocity of Sound in the Atmosphere. G. Brancato 4600
Reflecting Power of the Earth's Surface for Sound Waves incident Normally. F. Eisner and K. Krüger 4993
See also 1139, 1972 *under* 1 ; 1150 *under* 9 ; 4189 *under* 11.

7. Supersonic Vibrations.

Ultrasonic Waves. P. Biquard 312, 3713
Quasi-Standing Waves in a Dispersive Gas. D. G. Bourgin 314
Optical Properties of Solids and Liquids under Ultrasonic Vibrations. R. Lucas and P. Biquard 569
Brief Survey of Supersonics. J. C. Hubbard 677
Magnetostriction Oscillator Producing Intense Audible Sound and Some Effects Obtained. N. Gaines 678
Scattering of Light by Sound Waves. P. Debye 679
Diffraction of Light by Elastic Waves. R. Lucas 1145
Absorption and Diffusion of Ultrasonic Energy. E. Paolini 1572
Optical Method of Determining Absorption of Ultrasonic Waves by Liquids. P. Biquard 1573
Preparation of Colloids by Ultrasonic Dispersion. N. Marinesco 1674
Influence of Supersonic Waves on Chemical Processes. H. Beuthe 1977
Formation of Emulsion by Supersonic Vibrations. W. Daniewski 2125
Action of Ultrasonic Waves on Photographic Plates. N. Marinesco and J. J. Trillat 2510
Diffraction of Light by Ultrasonic Sound Waves. R. Bär and E. Meyer 3498
Supersonic Interferometer and Absorption Measurements. W. D. Hershberger 3714
Sound Absorption in Non-Reactive Gas Mixtures. R. Lawlor 3715
Decomposition of Complex Molecules by Means of Supersonic Waves. A. Szalay 3716
Vibrating Quartz Crystals and their Sound Emission. K. Bücks and H. Müller 4292
Absorption Coefficients of Liquids for Supersonic Vibrations. P. Biquard 4601
Heat Capacities of Cis- and Trans-Dichloroethylenes. A. R. Olson and F. W. Brittain 5360
Investigation of Supersonic Waves by Means of the Resistance Thermometer. N. N. Malov 5380
Optical Demonstration of the Wall Thickness of Maximum Transparency for Ultrasonic Waves. E. Hiedemann and H. R. Asbach 5381
Velocity of Supersonic Waves in Liquids. L. Bergmann 5382
Supersonic Interferometer for the Study of the Pressure Coefficient of Velocity. J. C. Swanson 5383
See also 1138, 1972 *under* 1 ; 682 *under* 3 ; 313 *under* 5 ; 680 *under* 8 ; 315 *under* 9.

8. Architectural Acoustics.

Measurement of Sound Insulation Properties at Ultrasonic Frequencies. N. N. Malov and S. N. Rschevkin 680
Sound Insulating Properties of some Types of Structure. H. Kreüger and J. H. Sager 681
Acoustics of Large Auditoria. S. Lifshitz 1146

For the **Key** to this Index see pp. 1358 to 1372.

Acoustics, *continued*.

	Abstract Nos.
Optimum Acoustical Damping for Rooms. H. Benecke	1147
Transmission of Vibrations Through Solid Materials. B. E. Eisenhour and F. G. Tyzzer	1148
Sound Field in the Neighbourhood of An Absorbent. G. v. Békésy	1574
Calculation of the Average Coefficient of Sound Absorption. C. F. Eyring	1978
New Reverberation Period Formula. W. J. Sette	1979
Variation of Acoustical Absorption Coefficient of Porous Bodies with the Angle of Incidence and Frequency. V. Kühl and E. Meyer	2511
Transmission of Sound through Partitions. A. H. Davis	2512
Audibility of Sounds of Varying Intensity. G. v. Békésy	3126
Auditorium Acoustics. J. Brillouin	3717
Absorption of Sound by Porous Materials. H. L. Penman and E. G. Richardson	3718
Theory of Sound Absorption in Porous Walls. L. Cremer	4175
Study of Reverberation of Sound by Means of an Automatic Apparatus. M. J. O. Strutt	4181
Principles of Acoustical Insulation. V. L. Chrisler	4602
Frequency Modulated Signals in Reverberation Measurements. F. V. Hunt	4994
Transportable Apparatus for Measurement of Reverberation Time and Sound Intensity. J. Holtsmark and V. Tandberg	5392

See also 1139 *under* 1; 1572 *under* 7; 3724 *under* 10; 2513, 4192, 5389, 5390, 5391 *under* 11.

9. Receivers and Reproducers.

Detector for H.F. Sounds. H. Kröncke	315
Evolution and Present State of Microphone Technique. P. Chavasse	1149
Directive Properties of Parabolic Reflectors. K. Satô and M. Sasao	1150
Piezoelectric and Dielectric Characteristics of Rochelle Salt. E. Schwartz	1238
Dimensions of the 16-mm. Sound Film. R. P. May	1458
Measurement of Small Electrodynamic Forces with the Condenser Microphone. A. Agricola	2633
Application of Kennelly's Method to Electrodynamic Loud-Speakers. G. le Guen	3719
Classification of Microphones. A. Charkewitsch	3720
Electrical Reproduction of Sound. P. Toulon	4182
Logarithmic Recorder for Frequency Response Measurements at Audio-Frequencies. S. Ballantine	4184
Photoelectric Reading Machines. G. Schutkowski	4288

See also 1137, 1970 *under* 1; 310, 1140, 1141, 1142, 1143, 2505, 3123, 3124, 4597 *under* 2; 1981, 1982, 4187 *under* 11; 684 *under* 12.

10. Speech and Hearing. Noise.

Noises in Amplifiers of Photoelectric Cells. F. v. Orbán	316, 4287
Analysis of Aircraft Noises. F. Eisner, H. Rehm and H. Schuchmann	317
Noise Emitted by Revolving Airscrews. J. Obata, S. Morita and Y. Yosida	318
Noise Emitted from Model Airscrews. J. Obata, Y. Yosida and S. Morita	319
Accuracy of the Aural Method of Measuring Noises. J. Obata and S. Morita	320
Structure of the Vowels. P. Kucharski	1151
Sounds Emitted by Model Airscrews. J. Obata, S. Morita and Y. Yosida	1575
Aural Localisation of Various Sounds. M. Reich and H. Behrens	1576
Loudness and the Minimum Perceptible Increment of Intensity. R. R. Riesz	1980
Analysis and Study of Machine Noises. J. F. Bouscasse	3721
Minimum Audible Sound Fields. L. J. Sivian and S. D. White	3722
Tuning-Fork Audiometer. E. Z. Stowell	3723
Two Integral Laws of Hearing. Intensity and Time of Audition of a Sound Impulse. S. Lifschitz	3724
Tactual Perception of Musical Intervals. L. D. Goodfellow	4183
Estimation of Fractional Loudness. P. H. Geiger and F. A. Firestone	4185
Portable Meter for Noise Measurement and Analysis. W. O. Osbon and K. A. Oplinger	4186
Sharp Sounds and the Theory of Hearing. G. v. Békésy	4603
Sound Track of the Vowel *ah*. E. W. Scripture	4995
New Method of Frequency Analysis and its Application to the Investigation of Aircraft Noises. F. Eisner	4996
Silencing Aircraft. A. H. Davis	4998

Acoustics, *continued*.

Abstract Nos.
Analysis and Interpretation of Vowel Tracks. E. W. Scripture............ 5384
Rôle of the Tympanic Membrane and Ossicles in the Hearing of Subjective Tones. D. Lewis and S. N. Reger........................ 5385
Loudness, Its Definition, Measurement and Calculation. H. Fletcher and W. A. Munson 5386
Proposed Standards for Noise Measurement. H. Fletcher 5387
Acoustical Theory of Exhaust Silencers of the Perforated Baffle Type. A. H. Davis 5388
See also 3126 *under* 8; 1982, 2516, 2517, 3127, 3128, 3129, 4997 *under* 11.

11. Measurements of Absorption, Amplitude, Intensity, Frequency, Waveform, Radiation Pressure.

Absolute Measurement of Fundamental Quantities in Sound. Z. Carrière.... 321
New Rectifier for Sound Wave Pressures. F. Ribbentrop.................. 683
Improved Vibrograph and Applications. T. Tirunarayanachar............ 873
Two-Dimensional Flow as a Variation Problem. G. Braun................ 877
Use of Pressure Gradient Microphones for Acoustical Measurements. I. Wolff and F. Massa 1981
Investigation of Acoustic Threshold Values. The Thermophone and its Use for Acoustic Measurements. W. Geffcken and L. Keibs 1982
Sound Absorption. E. Wintergerst and H. Klupp 2513
Estimation of Sound Pressure at Aural Limit by Means of Thermophone. E. Waetzmann and W. Geffcken 2516
Acoustic Demonstration Apparatus. E. Waetzmann 2517
Loudness of Noises. H. Barkhausen and U. Steudel 3127
Perception and Measurement of Sound Intensity. U. Steudel............ 3128
Loudness Measurements. F. Trendelenburg.............................. 3129
Sensitive Rayleigh Discs for Sound Measurements. W. Grösser............ 3130
Electrical Methods for Production of Measurement of Musical Frequencies. P. Nicolas 4187
Fundamental Sound Generated by Airscrew of Aeroplane in Flight. E. T. Paris.. 4188
Propagation of Sound along the Slipstream of an Airscrew. E. T. Paris.... 4189
Sound Output of a Grand Piano. E. Lübcke and K. H. Wernicke.......... 4190
Transmission Loss Through Partition Walls. E. H. Bedell and K. D. Swartzel, Jr. 4192
Sound Absorption in Non-Reactive Gases. D. G. Bourgin.................. 4604
Determination of Absorption for Sound Waves Incident Obliquely. Stationary Wave Method. L. Cremer 4605
Musical Air Bubbles and the Sounds of Running Water. M. Minnaert...... 4606
String Controlled A.C. Source. L. H. Stauffer.......................... 4696
Propagation of Sound in Nitrogen Tetroxide. W. T. Richards and J. A. Reid 4992
Intensity of L.F. Sounds close to a Metal Airscrew. C. F. B. Kemp........ 4997
Sensitivity of Finger-Tips to Vibrations at Various Frequency Levels. L. D. Goodfellow 4999
Resistance to Air-Flow in Sound Absorbers. A. Gemant.................. 5389
Absorption of Sound in Air, Oxygen and Nitrogen. Effects of Humidity and Temperature. V. O. Knudsen 5390
Interpretation of the Anomalous Sound-Absorption in Air and Oxygen in Terms of Molecular Collisions. H. O. Kneser.................... 5391
See also 1970, 1971 *under* 1; 311, 676, 2505, 4176, 4598, 4988 *under* 2; 682 *under* 3; 152 *under* 5; 2509 *under* 6; 1572, 1573, 3714, 3715, 4292, 4601 *under* 7; 680, 1148, 1574, 1978, 2511, 2512, 3718, 4994, 5392 *under* 8; 315, 1150, 4184 *under* 9; 1980, 3723, 4185, 4996, 5386, 5387 *under* 10; 2515 *under* 12.

12. Unclassified.

Position Finding by Under-Water Signals. B. R. Hubbard.................. 684
Propagation of Waves of Expansion in Sea-Water. K. Kitagawa............ 685
Audibility of the Aurora and its Appearance at Low Atmospheric Levels. C. S. Beals 1406
Vibrations Produced in Bodies by Contact with Solid Carbon Dioxide. Mary D. Waller 1983
Sonic Nephelometer. J. S. Wilson 2347
Range of Sound Intensity in Music. K. W. Wagner 2515

Acoustics, *continued.*

Abstract Nos.

Acoustical Properties of the Japanese Wind Instrument, Syakuhati. J. Obata and T. Tesima 3725

Stroboscopic Demonstration of Tones. W. Anderson and H. Lowery...... 4191

Adsorption.

1. Theory.
2. Adsorption at Interfaces :
   (*a*) Liquid-Gas.
   (*b*) Liquid-Liquid.
   (*c*) Solid-Gas.
   (*d*) Solid-Liquid.
3. Electrical Phenomena at Interfaces.
4. Apparatus and Technique.
5. Unclassified.

Cross-References :
Monomolecular Surfaces and Allied Phenomena, *see* Surface Tension and Cohesion, 5.
See also Thermodynamics, 5.

1. Theory.

Adsorption of Gases on Solids. R. S. Bradley........ 2

Adsorption and Capillary Condensation. G. Lindau 6

Extension of the Phase Rule for Adsorption under Equilibrium and Non-Equilibrium Conditions. I. Langmuir 1556

Discontinuities and Nature of Adsorbent Solids. G. H. Piper........ 2101

Theory of the Monomolecular Adsorption Layer. N. Fuchs........ 2668

Theoretical Explanation of the Freundlich Adsorption Isotherm. B. Tamamushi 3279

Adsorption and Capillary Condensation. M. Polanyi 4709

Capillary Condensation of Vapours on Porous Sorbents. M. Dubinin...... 4710

Molecular Theory of Interfaces. Part I. M. Volmer 4714

Nature of Active Carbon. E. Berl and L. Reinhardt........ 4715

Elementary Deduction of Gibbs' Adsorption Theorem. F. O. Koenig and R. C. Swain........ 4717

Evaporation of Atoms, Ions and Electrons from Caesium Films on Tungsten. J. B. Taylor and I. Langmuir 5093

Analysis of Hydrogen Adsorption Phenomena. M. C. Johnson........ 5095

Decrease of the Interfacial Energy and Increase of the Dispersibility of Solids on the Formation of an Adsorption Layer. P. Rehbinder and N. Kalinowskaja 5096

Capillary-Electrical Investigations on Silver Halogen Compounds. H. R. Kruyt 5109

Orientation of Molecules at Boundary Surfaces. H. Freundlich........ 5183

Quantum Mechanics and Overvoltage. R. W. Gurney 5431

See also 2099 under 2 (*c*).

2. Adsorption at Interfaces.

(*a*) *Liquid-Gas.*

Adsorption of Paraffin Vapours on Water: Significance of Traube's Rule. H. Cassel and M. Formstecher 1

Adsorption. Part I. Carbon Dioxide, Sulphur Dioxide and Water. Part II. Lower Fatty Acids. R. C. Bosworth 813

(*b*) *Liquid-Liquid.*

Theory of Emulsions. C. H. M. Roberts 840

Linear Phenomena. Part I. D. L. Talmud, B. A. Talmud and S. E. Bresler 1245

Interfacial Activity and Orientation of Polar Molecules. Part IX. Applicability of Antonov's Rule, Particularly to Adsorbed Films. A. Taubmann 1354

Solvation of Molecules and the Equation of State of the Adsorption Layer. S. E. Bresler, J. B. Chariton, B. A. Talmud and D. L. Talmud 3877

Attraction of Insoluble Substances by Liquid Interfaces. H. Devaux 3954

See also 1 *under* 2(*a*).

(*c*) *Solid-Gas.*

Adsorption of Carbon Dioxide, Ethylene and Hydrogen on Pyrophoric Iron and Powdered Gold. A. Magnus and R. Klar........ 3

Heats of Adsorption of Hydrogen and Carbon Monoxide on Copper. R. A. Beebe 4

Spectrum of Adsorbed Iodine. D. Chilton and E. Rabinowitsch 245

Calorimetric Investigations in the Temperature Region of Liquid Helium. K. Mendelssohn and J. O. Closs 642

Sorption of Vapours on Wood and Cellulose. N. H. Grace and O. Maass...... 814

Adsorption, ***continued.***

Abstract Nos.

Adsorption of Gases by Active Charcoal. H. Remy and W. Hene 815
Test of Adsorption Formulæ with Adsorption Measurements on a Highly Active Charcoal. E. L. Lederer 816
Equilibrium of Atoms and Ions Adsorbed on a Metal Surface. R. C. Evans .. 1246
Discontinuities in the Sorption Process. L. J. Burrage 1249
Sorption of Water Vapour by Glass. E. P. Barrett and A. W. Gauger 1250
Expansion and Contraction of Coal Caused Respectively by the Sorption and Discharge of Gas. H. Briggs and R. P. Sinha 1664
Measurement of Adsorption with Flowing Gases. H. Remy and W. Hene .. 1665
Adsorbed Caesium Films on Tungsten. I. Langmuir 1668
Rate of Adsorption at Constant Pressure. P. V. McKinney 2098
Studies in Adsorption. Part I. Mechanism of the Activation of Charcoal. Part II. Mechanism of the Adsorption of Vapours by Unactivated Charcoal. Part III. Effect of Activation of the Charcoal on the Isothermals of Carbon Tetrachloride. Part IV. Effect of Activation of the Charcoal on the Isothermals of Water, and its Relation to Hysteresis. Part V. Sorption of Vapours by Activated Charcoal. Part VI. Comparison of Isothermals of CCl$_4$ and CS$_2$ on Charcoal. L. J. Burrage 2099, 2100, 3274
Adsorption of Hydrogen on Pyrex and Quartz. A. T. Williamson 2663
Adsorption of Caesium at Layers of Calcium Fluoride. J. H. de Boer and C. J. Dippel 2664
Adsorption of Light by Adsorbed Iodine. J. H. de Boer and J. F. H. Custers 2936
Adsorption of SO$_2$ and CO$_2$ in the Region of Small Equilibrium Pressures. A. Magnus and H. Giebenhain 3271
Influence of Combined Oxygen on the Adsorption of Vapours by Porous Solids. Part I. L. J. Burrage 3272
Nature of the Sorption of Water by Charcoal. J. W. McBain, J. L. Porter and R. F. Sessions 3273
Activated Adsorption. L. J. Burrage 3275
Detection of Adsorbed Gas Films on Heated Filaments. G. van Praagh 3870
Chemisorption on Charcoal. Acid Constituent of Charcoal. A. King 3871
Adsorption of Iodine by Potassium Iodine. B. Whipp 3872
Kinetics and Heat of Adsorption of Oxygen on Platinum. E. B. Maxted and N. J. Hassid 3876
Influence of Combined Oxygen on the Determination of the Vapour Isothermals on Porous Solids. Part II. L. J. Burrage 4301
Adsorption of Gases at Low Pressures by Carbon and Silicic Acid Gel. O. Winkler 4302
Adsorption of Atomic Hydrogen by Glass and CaF$_2$. J. H. de Boer and J. J. Lehr 4711
Discontinuity in the Adsorption of Gases, Vapours and Liquids on Solid Surfaces at the Critical Temperature and Pressure. H. E. Morris and O. Maass 4712
Clean-Up of Hydrogen by Magnesium. A. L. Reimann 4713
Alteration of the Shape of Isotherms on Progressive Activation of Charcoal. B. Bruns and O. Zarubina 4716
Activated Adsorption of Gases by Carbon. R. Burstein, P. Lewin and S. Petrow 5097
See also 2, 5095 *under* 1; 5098 *under* 2 (d); 3277 *under* 3; 818, 1248, 2104 *under* 4.

(*d*) *Solid-Liquid.*

Swelling of Charcoal. Part II. Expansion Due to Water, Benzene and Pyridine Vapours. D. H. Bangham, N. Fakhoury and A. F. Mahamed 5
Adsorption and Classical Diffusion. A. T. McKay 47
Photographic Study of the Growth of Electrolytic Striations. R. Taft and O. R. Bingham 364
Adsorption Displacement and Molecule Orientation at Active Ash-Free Carbon. E. Landt and W. Knop 417
Heat of Wetting of Silica Gel. R. Berthon 418
Adsorption. W. Hardy and Millicent Nottage 504
Adsorption of Electrolytes by Ash-Free Charcoal. E. J. Miller 817
Separation of Very Small Quantities of Substances on Crystallising Precipitates. R. Mumbrauer 1247
Adsorption and Quantity of Adsorbent. Part I. A. Rabinerson 1666
Application of the Gibbs Adsorption Theorem to Solid-Liquid Interfaces. F. E. Bartell, F. L. Miller and E. G. Almy 1667

Adsorption, *continued.*

Abstract Nos.

Heats of Wetting of Cellulose Acetate by Aliphatic Alcohols and Aromatic Hydrocarbons. S. E. Sheppard and P. T. Newsome 2102

Adsorption and Solution Volume. Part II. Dependence of the Ionic State on Dilution. E. Ivanova and A. Rabinerson 2665

Adsorption in Solutions and Physical Properties of the Solvent. Part II. E. Heymann and E. Boye 2667

Mechanism of the Activation of Carbon. N. Bach and I. Lewitin............ 3276

Adsorption of Thorium-B and Thorium-C from Solution. Part I. J. E. King and A. Romer 3873

Inversion of Traube's Rule by Adsorption. B. Iliin.................. 3874

Adsorbent Properties and Specific Surface of Lead Sulphate. I. M. Kolthoff and C. Rosenblum 3875

Solid-Liquid-Air Contact Angles and their Dependence upon the Surface Conditions of the Solid. F. E. Bartell and A. D. Wooley 4792

Surface Oxides of Charcoal and Adsorption of Electrolytes. L. Lepin 5098

Ionic Adsorption at Metals and Charcoal. A. Frumkin 5099

Properties of the Double Layer and the Exchange Adsorption of Ions at Non-Metallic Surfaces. B. P. Nikolski 5100

Adsorption of Electrolytes and ζ-Potential. A. J. Rabinowitsch 5101

Cataphoretic Mobility of Adsorbed Proteins. A. Dummett and P. Bowden.... 5112

See also 814, 2099, 2100, 3274, 4302, 4712 *under* 2 (*c*) ; 2104 *under* 4.

3. Electrical Phenomena at Interfaces.

Gas Adsorption on Electrically-Conducting Films During their Condensation from Molecular Rays. M. C. Johnson and T. V. Starkey.................. 2666

Phase Boundary Potentials of Adsorbed Films on Metals. Part I. Oxygen on Gold. H. K. Whalley and E. K. Rideal. Part II. Iodine on Platinum. L. Jacobs and H. K. Whalley. Part III. Interaction of Copper and Iodine Vapour by the Method of Surface Potentials. H. K. Whalley and E. K. Rideal 3277

Electrical Adsorption and Stability of Colloids. A. Ganguli 3278

Influence of the Adsorbed Gas Layer on Photoelectric Sensitivity. B. Abendroth 5484

Work Function and Photoelectric Properties of Metals. P. I. Lukirsky...... 5489

See also 817, 2667, 5098, 5099, 5100, 5101, 5112 *under* 2 (*d*).

4. Apparatus and Technique.

Action of Breathing Filters. H. Engelhard and K. Pütter 818

Improved Method for the Determination of Isothermals by the Retentivity Technique. L. J. Burrage 1248

New Method for Obtaining Data for the Sorption of Vapours by Solids. J. L. Porter 2104

Range of Surface Forces. F. P. Bowden 5180

See also 1245 *under* 2 (*b*) ; 814, 1665, 3272, 3273, 4302 *under* 2 (*c*) ; 5, 1667, 3875 *under* 2 (*d*) ; 3277 *under* 3.

5. Unclassified.

Preparation and Properties of Thin Lead Sulphide Layers with Special Consideration of their Detector Action. Part I. G. Brückmann 5410

Alternating-Current Networks.

1. Bridges for Measuring Capacitance, Inductance, Frequency and Power Factor.
2. Filter Circuits.
3. Analysis of Non-Electrical Systems into their Equivalent Electrical Circuits.
4. Unclassified.

Cross-References :

Filter Circuits ; *see also* Section B.—Electrical Engineering.

Frequency, *see also* Oscillations, Electric, 4.

1. Bridges for Measuring Capacitance, Inductance, Frequency and Power Factor.

Measurement of the Phase Angles of Shielded Resistors. L. J. Berberich .. 1152

Measurements on Blocking-Layer Rectifier Photoelectric Cells. W. Meyer and A. Schmidt 1659

Alternating-Current Networks, *continued.*

Abstract Nos.

Dipole Rotation in Certain Crystalline Solids. S. E. Kamerling and C. P. Smyth 2018
Dielectric Constant of Liquid Sulphur. H. J. Curtis 2024
Extension of Maxwell's Rule for Analysing Electrical Networks. Y. H. Ku .. 2519
Measurement of Power Factor and Capacitance of a Condenser by Comparison with a Mutual Inductance. A. W. Smith 3131
Valve-Voltmeter for Measurements of Hydrogen-Ion Concentration. A. S. McFarlane 3159
Comparison of the Mutual-Inductance between Two Coils with the Self-inductance of one of them. H. Mukherjee 4607
Simple Frequency Bridge. R. M. Davies 4608
Determination of a Mutual Inductance in Terms of the Self-Inductance of its Components. L. M. Chatterjee 5000
New Wheatstone Bridge Circuit. E. Hasché 5393

2. Filter Circuits.

Theory of Electric Filters. V. Bubenick 687
Filter for X-Ray Power Supply. J. B. Hoag and V. J. Andrew 1114
String Controlled A.C. Source. L. H. Stauffer 4696
New Method of Frequency Analysis and its Application to the Investigation of Aircraft Noises. F. Eisner 4996

3. Analysis of Non-Electrical Systems into their Equivalent Electrical Circuits.

Experimental Demonstration of the Effects of Coupling of Harmonic Motions, as Illustrating Phenomena in Quantum Mechanics. A. C. Burton 486
Analogy between Mechanical and Electrical Systems. F. A. Firestone 2520
Analogy between Electrical and Mechanical Oscillations. C. Ramsauer 3856
Electromagnetic Analogy. E. Frola 5067

4. Unclassified.

System Equivalent to a System of Two Circuits Coupled Inductively. C. Rimini 776
Extension of the Methods of Heaviside's Calculus in the Calculations of (Electrical) Circuits Containing Parameters Varying with Time. J. Neufeld 1577
Use of Arithmetico-Geometric Mean Series for the Calculation of Elliptic Integrals, with Special Reference to the Calculation of Induction. F. W. Grover 3841
Equivalent Circuit of a Blocking-Layer Photo-Cell. E. A. Wood 4286
Application of Methods of Geometrical Inversion to the Solution of Problems in Electrical Resonance. W. G. Cady 5487

Astronomical Apparatus and Observatory Equipment.

Synchronous Motor Operation of Astronomical Telescopes. G. W. Moffitt 122
Nature of Dependences in Reduction of Astrographic Plates. H. G. Plummer 123
Determination of Radial Velocities with the Hartmann Spectro-Comparator. H. Nöbel 137
Correcting Lenses for Refractors. F. E. Ross 227
Photographic Spectrophotometry. J. Wempe 505
Thermionic Amplifier for the Photometry of Stars. A. E. Whitford 506
Micrometric Measurements of Eros, 1930-1931. W. H. van den Bos and W. S. Finsen 508
Franklin Institute Eclipse Expedition. J. Stokley 909
Deformations of Large Astronomical Mirrors. A. Couder 1030
New Aircraft Sextant. L. Becker 2247
Use of Bubble Sextant at Sea. E. O. Hulbert 2248
New Method of Using the Spectrograph for Solar Rotation Work. J. Evershed 2274
Testing a Tube Sensitometer. W. S. Armstrong 2375
Trial of a Projection Method for Measuring Photographs. F. Schlesinger and A. L. Bennett 2839
Construction of a Telescope Mirror of 1·20 m. Diameter. A. Couder 2840
Astrometry with Mirrors and Lenses. F. E. Ross 2841
Photoelectric Methods in Astrophotometry. F. Löhle 2842

Astronomical Apparatus and Observatory Equipment, *continued.*

Abstract Nos.

Impersonal Astrolabe. H. Chrétien 3396
Apparatus for Measuring the Absolute Personal Equation in Prism Astrolabe Observations. (Mrs.) E. Chandon, R. de Volontat and A. Gougenheim 3397
New Interference Micrometric Method Applicable to Double Stars and Satellites of Jupiter. A. Danjon 3398
Photometry of Solar Eclipse Phenomena. C. H. Sharp, S. McK. Gray, W. F. Little and H. J. Eckweiler 3421
Photometric Observations of Twilight. W. M. Smart 3445
Evaporated Films for Large Mirrors. R. C. Williams and G. B. Sabine...... 3532
Theory of Secular Aberration. Y. Hagihara 3943
Clock Corrections from Photographic Zenith Tube Observations. F. B. Littell 3956
Investigation of Measuring Machine and Methods for Measuring Differential Motions. P. J. van Rhijn and J. J. Raimond, Jr. 3963
Optical Tests of the 69-Inch Perkins Observatory Reflector. H. T. Stetson.. 3964
Greenwich Personality and the Equinox Correction. J. K. Fotheringham.... 3993
Photographic Plates for Use in Spectroscopy and Astronomy. C. E. K. Mees 4064
Method of Projecting Star Images Having Coma and Astigmatism. R. Kingslake and A. B. Simmons 4079
Year 1900 as Standard Equinox (Second Paper). E. C. Bower 5194
Toronto University 74-inch Reflecting Telescope. 5195
Use of Hartmann Spectro-Comparator. J. Hartmann 5196

Atomic and Molecular Structure.

1. Nuclear Constitution.
2. Artificial Disintegration of Elements.
3. Isotopes and Isobares.
4. Neutrons.
5. Periodic System.
6. Arrangement of Orbital Electrons.
7. Valency.
8. Molecular Structure.
9. Association.
10. Atomic and Molecular Magnitudes.
11. Unclassified.

Cross-References :
Atomic and Molecular Rays, *see* Kinetic Theory of Matter, 3.

Cross-References (contd.) *:*
Atomic and Molecular States, *see* Spectroscopy, 2 and 3.
Critical Potentials, *see* Conduction (Electric) and Discharge in Gases, 5.
Dipole Moments and Molecular Polarisation, *see* Dielectrics and Capacitance, 2.
Nuclear Moments, *see* Spectroscopy, 2*g*.
Ramsauer Effect, *see* Electrons, Positrons and Protons, 3.

1. Nuclear Constitution.

Multiply-Charged Particles of Mass One. M. Delbrück 179
Theory of Atomic Nuclei. E. N. Gapon 992, 2331, 2924, 4447
Radiation from Glow Electrons. L. Nedelsky 1021
Hyperfine Structure and Atomic Nuclei. H. Kallmann and H. Schüler...... 1045
Bond Energies and Mass Defects in Atomic Nuclei. W. M. Latimer and W. F. Libby 1828
Structure of Atomic Nuclei. W. Heisenberg 1842
Linear Momenta of Electrons in Atoms and in Solid Bodies as Revealed by X-Ray Scattering. J. W. M. DuMond 2454
Constitution of Metallic Sodium. E. Wigner and F. Seitz 2673
Atomic Masses and Structure of Atomic Nuclei. K. T. Bainbridge 2675
Atoms, Molecules and the Atmosphere. S. Chapman 2891
Nuclear Theory. E. Majorana 2923
Neutrons in the Nucleus. Parts I and II. A. Landé 2925
Wave Mechanics Model of the Neutron. S. Flügge 2926
Mass of the Neutron. J. J. Placinteanu 2930
Interpretation of Aston's Data. W. Swietoslawski 3280
Theory of the Nucleus. G. Wataghin 3458
Magnetic Moment of the Nitrogen Nucleus. R. F. Bacher 3834
Charge Distributions in Fluorine and Neon. F. W. Brown 3937
Has the Negative Energy Spectrum an Influence on Nucleus Phenomena ? G. Beck 3938
Comparison of the Nuclear Theories of Heisenberg and Wigner. Part I. C. Eckart 4036
Passage of Photons Through Atoms. V. Trkal and F. Záviska 4138
Binding Forces in the Alkali and Alkaline Earth Metals According to the Free Electron Theory. O. K. Rice 4303

Atomic and Molecular Structure, *continued.*

Abstract Nos.
Scattering and Absorption of Electromagnetic Radiation by a Small Sphere. G. Beck and P. Wenzel 4465
Interaction between γ-Rays and Atomic Nuclei. E. Stahel and H. Ketelaar 5250
Constitution of Atomic Nuclei. S. Shimasaki 5259
See also 4305 *under* 3; 2334, 2929, 3222 *under* 4; 1251 *under* 7; 1669, 2107 *under* 8.

2. Artificial Disintegration of Elements.

Average Life of Activated Atomic Nuclei: Probable Cases of Impossibility of γ-Ray Emission. F. Perrin 550
Disintegration of Light Elements by Fast Protons. J. D. Cockcroft and E. T. S. Walton 1419
Atom Disintegration at Low Potentials. H. R. v. Traubenberg, A. Eckardt and R. Gebauer 1833
γ-Rays Produced during the Disintegration of Lithium. H. R. v. Traubenberg, A. Eckardt and R. Gebauer 1834
Disintegration of Lithium by High-Energy Protons. M. C. Henderson 1835
Production and Application of Fast Corpuscular Rays (Artificial Disintegration of Atoms). A. Brasch 1843
Entry of the Disintegrating α-Particle into the Nitrogen Nucleus and a General Relation between Heights of Nuclear Barriers and Atomic Number. E. C. Pollard 2329
Recent Researches upon the Transmutation of the Elements. (Lord) Rutherford 2330
Forces between Atoms and Ions. J. A. Wasastjerna 2800
Chemical Detection of Artificial Disintegration. F. A. Paneth and P. L. Günther 2921
Atomic Disintegration at Low Voltages. R. Döpel 2922
Atomic Disintegration by Proton Bombardment (Canal Rays). F. Kirchner 3476
E.H.T. Production for Artificial Disintegration of Atomic Nuclei. J. M. Ledeboer 4037
Atomic Nucleus and High Voltages. M. A. Tuve 4038
Positive Electrons Produced in Disintegrations. Irène Curie and F. Joliot 4039
Emission of Neutrons. Irène Curie and F. Joliot 4040
Transmutation of Elements by Protons. M. L. E. Oliphant and (Lord) Rutherford 4042
Artificial Disintegration of Aluminium. O. Haxel 4043
Artificial Disintegration of the Nitrogen Nucleus. E. C. Pollard 4044
Application of the FP-54 Pliotron to Atomic Disintegration Studies. L. R. Hafstad 4045
Energy Principle and Reversibility of the Elementary Processes. G. Beck 4443
Emission of Positive Electrons by γ-Radiation of Ra (B + C). Grinberg 4448
Transmutation of Lithium. M. L. E. Oliphant, B. B. Kinsey and (Lord) Rutherford 4453
Transmutation of Lithium and Boron. P. I. Dee and E. T. S. Walton 4454
Disintegration of Lead by Secondary Effects Produced by Penetrating Radiation. B. Rossi 4848
Atomic Disintegration by Penetrating Radiation. J. Barnóthy 4849
Hoffmann Collisions and Barnóthy's Theory. E. G. Steinke 4850
Atomic Disintegration with Neutron Emission. G. Kirsch and R. Trattner 4851
Disintegration of Nuclei of Nitrogen and Other Light Atoms by Neutrons. W. D. Harkins, D. M. Gans and H. W. Newson 4861
Possibility of Emission of Positive Electrons from the Nucleus of γ-Rays. A. Bramley 5251
Electrons Produced by Artificial Disintegration. Irène Curie and F. Joliot 5253
Disintegration of High Velocity Protons. J. D. Cockcroft 5254
See also 2334, 4450, 4852, 4853, 4854, 4860, 4862, 5255, 5256, 5257 *under* 4.

3. Isotopes and Isobares.

New Isotopic Effect. L. Goldstein 7
Infra-Red Spectrum of H^2Cl. J. D. Hardy 243
Isotopic Weight of H^2. K. T. Bainbridge 419
Technique for the Separation of Gaseous Isotopes and Application to Neon. G. Hertz 420

Atomic and Molecular Structure, *continued.*

Abstract Nos.

Isotope Displacement in Hyperfine Structure. G. Breit 604
New Methods of Mass Spectrometry. J. Mattauch 706
Mass Ratio of the Boron Isotopes from the Spectrum of BO. F. A. Jenkins and A. McKellar 819
Physical Atomic Weights. F. W. Aston 820
Relative Abundance of the Carbon Isotope, C^{13}. F. A. Jenkins and L. S. Ornstein 1252
Lead Isotopes. Edna R. Bishop, Margaret Lawrenz and C. B. Dollins 1253
Bismuth Isotopes. F. Allison and Edna R. Bishop 1254
Radium Isotopes. Edna R. Bishop and C. B. Dollins 1255
Isotopes of Uranium, Thorium and Thallium. R. Goslin and F. Allison 1256
Zero Point Energy and Separation of Isotopes. H. Eyring 1257
Researches upon the Isotopes of Oxygen, Neon and Chlorine. H. Kallmann and W. Lasareff 1258
Comparison of the Masses of He and H^1 on a Mass-Spectrograph. K. T. Bainbridge 1261
Radioactive Families. Edna R. Bishop 1407
Isotopes of Uranium, Thorium and Lead, and their Geological Significance. C. S. Piggot 1408
Measurement of the Intensity-Ratio of the Boron Isotopes B^{10} and B^{11}. L. S. Ornstein and J. A. Vreeswijk, Jr. 1487
Theory of Vibrational Isotope Effects in Polyatomic Molecules. E. O. Salant and J. E. Rosenthal 1506
Thermodynamic Properties of the H^{1}H^2, H^{2}H^2 Molecules and Compounds Containing the H^2 Atom. H. C. Urey and D. Rittenberg 1966
Atomic Masses of Ne^{20}, B^{11}, Ne^{22} and F^{19}. K. T. Bainbridge 2105
Nuclear Moments of Tellurium and Selenium Isotopes. S. Rafalowski 2413
Hyperfine Structure of the Lines of the Arc Spectrum of Rubidium. D. A. Jackson 2414
Atomic Weight of Lead from Bedford Cyrtolite. G. P. Baxter and C. M. Alter 2674
Separation of Isotopes by G. Hertz's Method. H. Harmsen 2676
Photochemical Separation of Isotopes. W. Kuhn and H. Martin 2962
Mass-Spectrograph of the Parabola Type with Increased Sharpness of Line. H. Lukanow and W. Schütze 3148
Isotopic Constitution and Atomic Weight of Lead from Different Sources. F. W. Aston 3281
Concentration of H^2 Isotope. G. N. Lewis and R. T. Macdonald 3282
Theoretical Considerations Concerning the Separation of Isotopes. H. Eyring and A. Sherman 3283
Spectroscopic Search for H^3 in Concentrated H^2. G. N. Lewis and F. H. Spedding 3284
Absence of Fine Structure in the Arc Spectrum of Silver. S. Tolansky 3549
Isotope Displacement Effect. H. Schüler and H. Westmeyer 3554
Hyperfine Structure and Nuclear Moments of Rubidium. H. Kopfermann .. 4093
Relative Abundance of Hydrogen Isotopes. W. Bleakney and A. J. Gould 4304
Atomic and Molecular Forms of the Hydrogen Isotopes. H. S. Taylor and H. Eyring 4305
Isotopes of Cobalt by the Magneto-Optic Method. T. R. Ball and S. S. Cooper 4306
Mass Ratios of the Lithium Isotopes from the Spectrum of Li$_2$. A. McKellar 4531
Limitation in Currents of Positive Alkali Ions of Homogeneous Velocities. P. Keck and L. B. Loeb 4707
Increase of the Concentration of H^{1}H^2 by Fractional Evaporation and Rectification. W. H. Keesom, H. van Dijk and J. Haantjes 4718
Isotope Shift in Neon. J. H. Bartlett, Jr. and J. J. Gibbons, Jr. 4929
Isotopic Fractionation of Water. E. W. Washburn, E. R. Smith and M. Frandsen 5041
Isotopes of Noble Gases and Hydrogen. P. Zeeman and J. de Gier 5102
Isotopes of Hydrogen. P. Zeeman and J. de Gier 5103
Micropyknometer for Estimation of Variations in the Isotope Ratio of Water. E. S. Gilfillan and M. Polanyi 5136
See also 992, 2331, 2924, 2675 *under* 1; 1672, 4310, 4723 *under* 10.

4. Neutrons.

Penetrating Power of Radiation (Neutrons) Produced from Beryllium by α-Particles. J. Thibaud and F. D. la Tour 555

Atomic and Molecular Structure, *continued*.

Abstract Nos.
Passage of Neutrons through Matter. H. S. W. Massey 556
Neutron and Neuton. W. D. Harkins 1420
Attempt to Demonstrate the Presence of Neutrons in the Atmosphere. W. Meissner and K. Steiner 1422
Experimental Proofs of the Existence of the Neutron. Irène Curie and F. Joliot 1423
Neutron and its Properties. J. Chadwick 1836
Diffusion of Neutrons. Inelastic Shocks on the Nucleus. P. Auger 1837
Theory of Diffusion of Neutrons. J. Solomon 1838
Neutrons. K. K. Darrow 1839
Emission of Neutrons from Light Elements Produced by α-Particle Bombardment. Irène Curie and F. Joliot 1840
Chemical Nature of the Neutron. P. Achalme 1841
Emission of Neutrons from Beryllium. G. Kirsch and F. Rieder 2332
Photographic Detection of Protons Liberated by Neutrons. Part II. Marietta Blau and Hertha Wambacher 2333
Neutron, Atom Building and a Nuclear Exclusion Principle. W. D. Harkins 2334
Spontaneous Neutron Emission? S. Pieńkowski and J. Starkiewicz 2335
Spontaneous Neutron Emission? H. Herszfinkiel and W. Wroncberg 2336
Electrical Distribution in Atoms and Ions. J. A. Wasastjerna 2798
Wave Mechanical Significance of the Apparent Radii of Atoms and Ions. J. A. Wasastjerna 2799
Interaction between Neutrons and Protons. J. Solomon 2927
Collisions between Neutrons and Protons. P. Auger and G. Monod-Herzen 2928
Law of Force between Neutron and Proton. E. C. Pollard 2929
Electromagnetic Field of a Moving Electrified Sphere and its Radiationless Orbits. G. A. Schott 3222
Protons and Positive Electrons. H. Mandel 3472
Electron Spin and Theory of the Neutron. W. Wessel 3474
Ionisation of Gases by Neutrons. T. W. Bonner 3475
Scattering of Neutrons and Protons. E. Wigner 4041
Mass of the Neutron. Irène Curie and F. Joliot 4450
Theory of the Neutron. J. J. Placinteanu 4451
Interaction between Neutrons and Protons. G. C. Wick 4452
Atomic Disintegration with Neutron Emission. J. Schintlmeister 4852
Neutron Emission from Beryllium and Boron and Atomic Disintegration by Neutrons. F. Rieder 4853
Excitation of Neutron Emission from Beryllium and Boron by α-Rays. W. Slonek 4854
Constitution of Neutrons, Positive Electrons, and Photons. Existence of Negative Protons. J. J. Placinteanu 4855
Neutrons and Nuclear Magnetic Moments. B. Venkatesachar and T. S. Subbaraya 4856
Neutrons and Positive Electrons. R. Fürth 4857
Collisions of Neutrons with Protons. F. N. D. Kurie 4858
Neutrons. J. Perrin 4859
Artificial Production of Neutrons. H. R. Crane, C. C. Lauritsen and A. Soltan 4860
The Neutron. J. Chadwick 4862
Excitation of Neutrons on Beryllium. G. Bernardini 5255
Velocity of Neutrons from Beryllium. G. Kirsch and Hertha Wambacher 5256
Production of Neutrons by High Speed Deutons. H. R. Crane, C. C. Lauritsen and A. Soltan 5257
Collisions of Neutrons with Light Nuclei. Part II. N. Feather 5258
Penetrating Radiation. Irène Curie and F. Joliot 5293
See also 1842, 2925, 2926, 2930, 3280 *under* 1; 4040, 4851, 4861 *under* 2; 5172 *under* 5.

5. Periodic System.

X-Ray Structural Measurements and Explanation by Tetrahedral Atomic Domains. R. Reinicke 1682
Regularities amongst Hydrides. E. Krebs 3029
Physical System of the Elements. C. G. Bedreag 5104
Molecular Symmetry and the Reduction of the Secular Equation. H. Eyring, A. A. Frost and J. Turkevich 5172
See also 824, 4506 *under* 10.

Atomic and Molecular Structure, *continued*.

6. Arrangement of Orbital Electrons.

Abstract Nos.
Wave Mechanical Theory of Refraction. J. A. Wasastjerna. 2797
Electron Distribution in Atoms and Ions. J. A. Wasastjerna 2798
Wave Mechanical Significance of the Apparent Radii of Atoms and Ions. J. A. Wasastjerna 2799
See also 2673, 2891 *under* 1; 1669 *under* 8.

7. Valency.

Quantum Mechanics of the Water Molecule. A. S. Coolidge. 8
Spectroscopic Determination of Electron Affinities. H. Kuhn 250
Vibration of Atoms at the End of Organic Molecules. Raman Effect and the Carbon-Chlorine Bond. W. D. Harkins and R. R. Haun 256
Semi-Classical Theory of the Chemical Bond. W. Heitler 421
Angle between the Oxygen Bonds by the Collision Area Method. W. A. Hare and E. Mack, Jr. 422
Optical Activity and Valance Theory. C. H. Johnson 1015
Chemical Bond. G. N. Lewis 1251
Quantic Theories of Valency. G. dalla Noce 1259
Electronic Structures of Polyatomic Molecules and Valence. Part IV. Electronic States, Quantum Theory of the Double Bond. Part V. Molecules RX*n*. R. S. Mulliken 1670, 3289
Three-Electron Bond in Chlorine Dioxide. L. O. Brockway 2106
Group Theory of Valency States. S. C. Kar 2219
Energy Values of Valency Bonds in Organic Compounds. J. A. Clopatt 2492
Electric Moment as a Measure of the Ionic Nature of Covalent Bonds. J. G. Malone 2577
Quantum Mechanics of Chemical Valency. H. Hellmann 2677
Binding and Activation Energies of Organic Molecules. W. Heitler and A. A. Schuchowitzki 2678
Determination of the Angles between Covalencies from Measurements of Electric Dipole Moment. G. C. Hampson and L. E. Sutton 3285
Molecular Vibrations of Three-Particle Systems with Special Applications to the Ethyl Halides and Ethyl Alcohol. P. C. Cross and J. H. van Vleck 3286
Calculation of the Vibration Frequencies and Other Constants of the H_2O Molecule. J. H. van Vleck and P. C. Cross 3287
Nature of the Chemical Bond. Part V. Quantum-Mechanical Calculations of the Resonance Energy of Benzene and Naphthalene and the Hydrocarbon Free Radicals. L. Pauling and G. W. Wheland. Part VI. Calculation from Thermochemical Data of the Energy of Resonance of Molecules Among Several Electronic Structures. L. Pauling and J. Sherman. Part VII. Calculation of Resonance Energy in Conjugated Systems. L. Pauling and J. Sherman 3288, 3878, 4720
Concentration of Valency Electrons in Binary Intermetallic Alloys. H. Perlitz 3299
Magnetic Interaction of a Valence Electron with Inner Shells. M. H. Johnson, Jr., and G. Breit 3934
Quantum Mechanics of Chemical Reactions Involving Conjugate Double Bonds. H. Eyring, A. Sherman and G. E. Kimball 4166
Theory of the Exchange Problem and of Ferromagnetism at Low Temperatures. C. Møller 4265
Paramagnetism and Chemical Union. E. Rabinowitsch. 4674
Rôle of Kinetic Electron Energy in Inter-Atomic Forces. H. Hellmann 4719
Dissociation of Diatomic Molecules with *p*-*p*-Bindings. H. Lessheim and R. Samuel 4928
Magnetic Study of Single Electron Bindings in Compounds of the Type of Tellurium Dimethyl Dihalide. S. S. Bhatnagar and T. K. Lahiri 5079
Theory of Multiple Bonds. A. Burawoy 5105
Character of Bonds in Hydrogen Halides as Found by Absolute Intensity Measurements of the Infra-Red Primary Bands. E. Bartholomé. 5333
See also 2673 *under* 1; 1682 *under* 5; 2111, 2112, 2113, 2114, 2679, 3879, 4721, 5107 *under* 6.

Atomic and Molecular Structure, *continued.*

8. Molecular Structure.

Abstract Nos.
Dipole Moments and Molecular Structure. Part III. Oxychlorides of Sulphur. J. W. Smith 359
Ultra-Violet Absorption Spectrum of Azoxybenzol. E. Müller and E. Hory 616
Colour and Structure of Oximes and Semi-Carbazones. (Mme) Ramart-Lucas and (Mme) M. Grumez 618
Oscillation and Rotation of the Ammonia Molecule. E. Fermi 620
Raman Effect and Free Rotation about a Bond. K. W. F. Kohlrausch 635
Studies in Co-ordination. Part IV. Some Fluorides and Chlorides and their Complex Ions. F. J. Garrick 659
Moments of Paramagnetic Ions in Salt Solutions. H. Auer 771
X-Ray Investigation of Normal Paraffins Near Their Melting Points. A. Müller 821
Density and Molecular State of Gaseous Rhenium Tetrachloride and Rhenium Hexachloride. D. M. Yost and G. O. Shull 822
Electrokinetics. Part XII. O. G. Jensen and R. A. Gortner 829
Structure of Nitrogen and the Different Phosphorescence of the Two Forms of Solid Nitrogen. L. Vegard 999
Band Spectrum, Predissociation and Structure of the P_2 Molecule. G. Herzberg 1050
Binding Energies in the Growth of Crystal Nuclei from Metallic Atoms. H. S. Taylor, H. Eyring and A. Sherman 1293
Relationship between Anisotropy of the Optical Polarisability and the Geometrical Structure of a Molecule. H. A. Stuart and H. Volkmann 1426
Infra-Red Absorption Spectrum of Hydrogen Cyanide. K. N. Choi and E. F. Barker 1500
Repulsion Exponents of Alkali Hydrides. A. Krebs 1507
From the Physics of the Atom to the Physics of the Molecule. O. M. Corbino 1669
Absorption of β-Rays by Organic Compounds and the Molecular Structure of the Latter. G. Fournier and M. Guillot 1830
Vibration Spectra and Molecular Structure of Methyl and Ethyl Alcohols. R. Titéica 1897
Freezing Point/Solubility Relations of Geometrical Isomers. Part II. E. L. Skau and B. Saxton 1946
X-Ray Investigation of Atomic and Molecular Structure. J. Weigle 2107
Determination of the Structures of the Hexaflourides of Sulphur, Selenium and Tellurium by the Electron Diffraction Method. L. O. Brockway and L. Pauling 2108
Model of Diatomic Rotator with Two Degrees of Freedom. L. Simons and E. H. Smart 2109
Structure of Alkali Hydride Molecules. A. Krebs 2110
Structure of CH_4 and Related Molecules. J. H. van Vleck 2111, 2112
Characteristic Vibrations in Valency Systems with Four Centres of Gravity. F. Lechner 2113
Calculation of Matrix Elements for Lewis Electronic Structures of Molecules. L. Pauling 2114
Relation between β-Ray Absorption by Organic Compounds and their Molecular Structure: Halogen Derivatives. G. Fournier and M. Guillot 2327
Depolarisation of Raman Lines from Liquids. J. Cabannes and A. Rousset 2446
Silane Formation during Hydrogen Discharge. E. Hiedemann 2540
Electronic Structure of Ethlenic Carbon. G. Allard 2679
Quantum Mechanics of Diatomic Systems. M. Born and S. Flügge 2802
Electron Diffraction in Gaseous SF_6, SeF_6 and TeF_6. H. Braune and S. Knoke 3210
Oscillation Structure of Electron-Transfer in Polyatomic Molecules. G. Herzberg and E. Teller 3562
Band Spectra and Molecular Structure. Part I. W. Weizel 3588
Molecular Structure of Polyhydric Alcohols Deduced from their Dispersion and Absorption for Radio-Frequencies. P. Girard and P. Abadie 3786
Free Radicals of Organic Chemistry. Quantum-Theory of Aromatic and Unsaturated Compounds. Part IV. E. Hückel 3879
Structure of Liquid Mercury. O. Kratky 3880
Four-Place Table of Sin x/x. J. Sherman 3927
Normal State of the Hydrogen Molecule. S. Weinbaum 3935
Composition of Electric Moments of Polyalcohols: Moments of Associated Dipoles. P. Girard and P. Abadie 4238

For the Key to this Index see pp. 1358 to 1372.

Atomic and Molecular Structure, *continued.*

Abstract Nos.

Electron Diffraction and Molecular Structure. R. W. Dornte 4259
Molecular Structure of Co-ordination Compounds of Platinum and Palladium. E. G. Cox and G. H. Preston 4307
Determination of the Structures of Methane Derivatives by the Electron Diffraction Method. R. W. Dornte 4308
Kerr Effect with Isomeric Benzene Derivatives. G. Otterbein 4457
Virial Theorem and Molecular Structure. J. C. Slater 4721
Molecular Structure of Ice and Liquid Water. E. L. Kinsey and O. L. Sponsler 4722
Investigation in the Infra-Red Region of the Spectrum. Part IX. Absorption Spectrum of Chlorine Monoxide (Cl_2O). C. R. Bailey and A. B. D. Cassie 4935
Electron Diffraction and Molecular Structure: Carbonyl Compounds. R. W. Dornte 5106
Quantum-Mechanical Stability of Benzine Molecule. M. Markov 5107
Allotropism of Beryllium. F. M. Jaeger and J. E. Zanstra 5122
Infra-Red Spectrum of Propane and Diacetylene. E. Bartholomé 5334
Raman Effect of Sulphuric Acid. L. Médard 5342
Para- and Ortho-Hydrogen. L. Farkas 5379
Electron-Diffraction Investigation of the Structure of Molecules of Methyl Azide and Carbon Suboxide. L. O. Brockway and L. Pauling 5441
Electron-Diffraction Investigation of the Molecular Structure of Cyanogen and Diacetylene, with a Note on Chlorine Dioxide. L. O. Brockway 5442
See also 2891 *under* 1; 4305 *under* 3; 421, 422, 1251, 1670, 2106, 2577, 2677, 2678, 3288, 3289, 3878, 4720, 5105 *under* 7.

9. Association.

Determination of the Magnitude, Shape and Solvation of Macro-Molecules. G. V. Schulz 20
Supposed Allotropy of Liquid Nitrobenzene. E. Cohen and L. C. J. te Boekhorst 423
Silicon Hydride-Monatomic, or Triatomic Hydrogen. A. B. van Cleave and A. C. Grubb 424
Association in Gases under the Effect of Electric Fields. H. Senftleben 644
Heats and Nature of Combination of Organic Molecular Compounds. G. Briegleb and T. Schachowskoy 658
Symmetry of the Benzene Molecule. V. Deitz and D. H. Andrews 1260
Cryoscopic Rules and Dipole Theory. W. Fischer 1943
Allotropy of Liquid Nitrobenezene. E. L. Lind and T. F. Young 2243
Osmotic Pressure by the Method of Isothermal Distillation. Part II. M. Ulmann 2726
Cybotactic View of the Interior of a Liquid. G. W. Stewart 3881
Fluidities and Associations of Alcohols and Esters of High Molecular Weight. E. C. Bingham and R. A. Stephens 3390
Kerr Effect and Association in Liquids. H. A. Stuart and H. Volkmann 4048
Dipole Moment and Association. G. Berger 4648
Surface Tension and Complex-Formation in Non-Aqueous Salt Solutions. P. P. and N. S. Kosakewitsch 4790
Absorption in the Far Ultra-Violet of Aqueous Solutions of Hydrochloric Acid. R. Tréhin 4918
Complex Formation due to Polarisation. Part I. System Kr-HCl. G. Glockler, C. P. Roe and D. L. Fuller 4984
Complex Formation due to Polarisation. Part II. System C_3H_8-HCl. G. Glockler, D. L. Fuller and C. P. Roe 4985
Fluidity Method for Determination of Association. E. C. Bingham and L. W. Spooner 5108
See also 3712 *under* 10.

10. Atomic and Molecular Magnitudes.

Revised Atomic Weight of Silicon. P. F. Weatherill and P. S. Brundage 9
Molecular Weight Micro-Method. A. C. Bratton, Jr., and H. L. Lochte 10
Calculation of the Molecular Weight of a Polar Colloid from Dielectric Dispersion Curves of its Aqueous Solution. B. M. Bloch and J. Errera 24
Density Curves and Rectilinear Diameter of Carbon Monoxide. E. Mathias, C. A. Crommelin, W. J. Bijleveld and P. P. Grigg 42

Atomic and Molecular Structure, *continued*.

Abstract Nos.
Densities of Saturated Vapours. R. Wright 671
Viscosity and Molecular Weight. E. O. Kraemer and F. J. van Natta 823
Relations of the Empirical Atom- and Ion-Radii to the Thomas-Fermi Charge Distribution in the Atom. W. Braunbek 824
Density of Ammonia at Reduced Pressures and its Relation to the Atomic Weight of Nitrogen, the Gas Constant R and the Limiting Molal Volume V_0. G. Dietrichson, C. W. Orleman and C. Rubin 1305
Atomic Radius of Carbon in Diamond. V. Posejpal 1671, 3292
Third Report of Committee on Atomic Weights of International Union of Chemistry. G. P. Baxter, (Mme) M. Curie, O. Hönigschmid, P. le Beau and R. J. Meyer 1672
Mass Defect of Helium. E. Wigner 1673
Crystal Structure of Potassium Bromoselenite. J. L. Hoard and B. N. Dickinson 1690
Revision of the Atomic Weight of Arsenic. Parts I and II. Analysis of Arsenic Tribromide and Trichloride. G. P. Baxter, W. E. Shaefer, M. J. Dorcas and E. W. Scripture, Jr. 2115
Physical Properties of Ethylamine. E. Pohland and W. Mehl 2466
Atomic Weight of Iodine. Guichard 2680
Revision of the Atomic Weight of Indium. G. P. Baxter and C. M. Alter 3290
Revision of the Atomic Weight of Arsenic. Comparison of Arsenic Trichloride with Iodine Pentoxide. G. P. Baxter and W. E. Shaefer 3291
Molecular Weight of Substances in Solution in Liquid Ammonia at Room-Temperature. A. I. Schattenstein and A. M. Monossohn 3712
Atomic Weight of Lead from Katanga Pitchblende. G. P. Baxter and C. M. Alter 3882
Revision of the Atomic Weight of Potassium. G. P. Baxter and W. M. MacNevin 4309
Atomic Weight of Less Volatile Potassium Prepared by Hevesy. G. P. Baxter and C. M. Alter 4310
Optical Determination of the Diffusion Constant of Sodium. L. A. Ginsel and L. S. Ornstein 4342
Nuclear Moments and Their Dependence upon Atomic Number and Mass Number. N. S. Grace 4506
Atomic Weights of Radioactive Substances. F. Western and A. E. Ruark 4723
See also 1828, 2675, 3280 *under* 1; 419, 1252, 1261, 2105, 2674, 3281 *under* 3; 2106 *under* 7; 3210 *under* 8; 20, 644 *under* 9.

11. Unclassified.

Cooperative Phenomena. F. Zwicky 1700
Symmetrical Vibrations. A. D. Fokker 3583
Formation of Metallic Hydrides by Atomic Hydrogen. E. Pietsch 4204
Atomic Chlorine. G. M. Schwab and H. Friess 4205
Atom as a Space-Time Quantum System. G. Beck 4385

Calorimetry.

1. Specific Heat:
   (*a*) Gases and Liquids.
   (*b*) Solids.
2. Latent Heat:
   (*a*) Fusion.
   (*b*) Evaporation.
3. Apparatus and Technique.
4. Unclassified.

Cross-References:
Heat of Adsorption, *see* Adsorption, 2.

Cross-References (contd.):
Heat of Combustion, *see* Thermochemistry, 2.
Heats of Formation and Dissociation, *see* Thermochemistry, 3.
Heats of Solution and Dilution, *see* Thermochemistry, 1.
Thermodynamics of Specific Heat and Latent Heat, *see* Thermodynamics, 3.

1. Specific Heats.

(*a*) *Gases and Liquids.*

Compressibility of Liquid Helium at 2·7° K. W. H. Keesom and K. Clusius 52
Specific Heats of Diatomic Gases Using Quantum Statistics. C. Gregory 274
Total and Specific Heats of a Series of Fractions of Petroleum and their Relation to Other Properties. Parts IX-XII. H. R. Lang and R. Jessel 275
Specific Heat of Liquid Helium. W. H. Keesom and K. Clusius 276
Anomaly in the Specific Heat of Liquid Helium. W. H. Keesom and (Miss) A. P. Keesom 277

Calorimetry, *continued.*

Abstract Nos.

Specific Heat and Heat of Dissociation of Gases at High Temperatures. K. Wohl and M. Magat ... 300
Internal Energy of Gases after Explosion. W. T. David, J. R. Brown and A. H. El Din ... 657
Low Temperature Specific Heats. Part III. Molecular Rotation in Crystalline Primary Normal Amyl Ammonium Chloride. J. C. Southard, R. T. Milner and S. B. Hendricks ... 1532
Heat Capacity Curves of the Simpler Gases. Part I. Gaseous Nitric Oxide. Part II. Gaseous Oxygen. H. L. Johnston and A. T. Chapman. Part III. Heat Capacity, Entropy and Free Energy of Neutral OH. H. L. Johnston and D. H. Dawson ... 1554, 4171
Heat Capacity and Free Energy of Formation of Ethylene. M. E. Haas ... 1930
Electrical Differential Method for the Measurement of C_v in Gases. Part V. M. Trautz and H. Blum ... 1931
Specific Heat of Oxygen at High Temperatures from Ozone Explosions and the Energy of the $^1\Delta$ Level of the Neutral Oxygen Molecule. B. Lewis and G. v. Elbe ... 1962
Heat Capacity Data for Durene, Penta-Methylbenzene, Stilbene and Dibenzyl. J. D. Ferry and S. B. Thomas ... 2464
Molecular Heats and Normal Oscillations of Ethane and Ethylene. A. Eucken and A. Parts ... 2465
Physical Properties of Ethylamine. E. Pohland and W. Mehl ... 2466
Heat Capacity and Related Thermodynamic Properties of Aqueous Solutions. Part II. Lithium and Sodium Hydroxides. F. T. Gucker, Jr., and K. H. Schminke ... 2467
Extra Specific Heat in Cuprous Sulphide; Specific Heat of Ferrous Oxide. W. P. White ... 2468
Molecular Heats of Organic Liquids. N. de Kollosowsky and W. W. Udowenko ... 4569
Specific Heat of the Restricted One-Dimensional Rotator. E. Teller and K. Weigert ... 4590
Effect of Magnetic Field and of Temperature on the Specific Heats of Gases. T. Okamura ... 4962
Heat Capacities of Cis- and Trans-Dichloroethylenes. A. R. Olson and F. W. Brittain ... 5360
Transition from Wave Equation to Heat Conduction Equation. W. Tschen ... 5362
Energy Exchange between Inert Gas Atoms and Solid Surface. J. M. Jackson and A. Howarth ... 5363
Exchange of Energy between Gas Atoms and Solid Surfaces. Part III. Accommodation Coefficient of Neon. J. K. Roberts ... 5364
See also 1533 *under* 1 (*b*); 2470 *under* 3.

(*b*) *Solids.*

Measurement of the Specific Heat of Silver from 1·35 to 20·3° K. W. H. Keesom and J. A. Kok ... 278
Change in Specific Heat of Tin when Becoming Supraconductive. W. H. Keesom and J. A. Kok ... 279
Specific Heats of Metals in the Stabilised and Non-Stabilised Conditions: Platinum, Silver, Copper and Gold. F. M. Jaeger, E. Rosenbohm and J. A. Bottema ... 280
Neumann-Joule-Kopp-Regnault Law of Molecular and Atomic Heats. F. M. Jaeger and J. A. Bottema ... 281
Investigation of the Cooling of Glowing Silit Rods by Photographic Pyrometry. R. Hase ... 287
Law of Additive Atomic Heats. J. A. Bottema and F. M. Jaeger ... 640
Behaviour of Beryllium after Preliminary Heating above 420° C. F. M. Jaeger and E. Rosenbohm ... 641
Calorimetric Investigations in the Temperature Region of Liquid Helium. K. Mendelssohn and J. O. Closs ... 642
Heat Capacities, Entropies and Free Energies of Seven Organic Compounds containing Nitrogen. H. M. Huffman and H. Borsook ... 664
Infra-Red Absorption Spectra of Ammonium Salts in the Region of their Anomalous Specific Heats. R. Pohlman ... 1056
Specific Heat of Monel Metal between—183° and 25° C. W. F. Hampton and J. H. Mennie ... 1115
Heat Capacity, Heat of Sublimation and Heat of Solution of Phosphorus Pentoxide. M. Frandsen ... 1533

Calorimetry, *continued*.

Abstract Nos.

Specific Heats of Tungsten, Molybdenum and Copper. H. L. Bronson, H. M. Chisholm and S. M. Dockerty 2469
Heat Capacity and Entropy of Calcium Oxalate from 19° to 300° Abs. Entropy and Free Energy of Oxalate Ion. W. M. Latimer, P. W. Schutz and J. F. G. Hicks, Jr. 2500
Thermal and Magnetic Behaviour of Gadolinium Sulphate in the Temperature Range of Liquid Helium. N. Kürti 2619
Calculation of Specific Heat of Solid Bodies. K. Honnefelder 3662
Specific Heat, Melting Point and Latent Heat of Fusion of Hydrogen Fluoride. J. Dahmlos and G. Jung 3663
Specific Heat of Copper from—78° to 0° C. S. M. Dockerty 4570
Variability of Specific Heat of Fused and Solidified Silver. F. M. Jaeger, E. Rosenbohm and W. A. Veenstra 5361
Correlation of Heat Capacity, Absolute Temperature and Entropy. G. A. Linhart 5374
See also 2464 *under* 1 (*a*).

2. Latent Heat.

(*a*) *Fusion.*
Quantum Theory of Latent Heat. H. C. Kudar 1116
Some Physical-Chemical Constants of Dioxan. W. A. Roth and Ingrid Meyer 1541
Cryoscopic Studies on the Transition Points of Compounds of Organic Compounds with Salts. H. Oosaka 1941
See also 2464 *under* 1 (*a*) ; 3663 *under* 1 (*b*) ; 2493 *under* 2 (*b*).
(*b*) *Evaporation.*
Absorption Spectra of Lithium Halides and Latent Heat of Evaporation of Lithium. M. S. Desai 632
Thermochemical Constants of the Hexafluorides of Sulphur, Selenium and Tellurium. D. M. Yost and W. H. Claussen 2493
Heat of Vaporisation of Hydrogen Fluoride. J. H. Simons and J. W. Bouknight 3073
Physical Properties of Di-Vinyl Ether. F. T. Miles and A. W. C. Menzies...... 3116
Latent Heats of Binary Mixtures. V. Fischer 3664
Thermal Effect Produced by the Exposure of Gold to Saturated Water Vapour. F. Barry and E. P. Barrett 4571
Thermodynamic Theory of Liquids. N. de Kolossowsky 4591
See also 2466 *under* 1 (*a*) ; 1533 *under* 1 (*b*) ; 3667 *under* 3.

3. Apparatus and Technique.

Calorimeter Cooling Correction in High-Temperature Calorimetry. F. M. Jaeger, E. Rosenbohm and J. A. Bottema 282
Calorimetric Method for Determining the Intrinsic Energy of a Gas as a Function of the Pressure. E. W. Washburn........ 283
Automatic Regulator for Thermostats or Adiabatic Calorimeters. H. Rieche.. 297
Heat Loss from Dewar Flasks. K. S. Cole and R. H. Cole 647
Calorimetric Determination of the Intrinsic Energy of Gases as a Function of the Pressure. F. D. Rossini and M. Frandsen 1117
Isothermal Calorimeter for Slow Reactions. E. D. Coon and F. Daniels 1534
Binary Liquid Systems and the Mixture Rule. W. MacFarlane and R. Wright 1701
Method for Interpolating Data, Based on Dühring's Rule. J. H. Perry and E. R. Smith 1739
Dielectric Loss in Glasses in Relationship to their Composition. F. Keller.... 2017
Determination of the Specific Heats of Liquids. A. Ferguson and J. T. Miller 2470
Standard States for Bomb Calorimetry. E. W. Washburn........ 3074
Ice Calorimeter for Measuring very Small Thermal Effects. W. Swietoslawski, A. Zmaczynski, I. Zlotowski, J. Usakiewicz and J. Salcewicz........ 3665
Calorimetric Method for Determining the Rates of Interdiffusion of Reacting Liquids. F. Barry and A. K. Smith 3666
Method of Measuring the Specific Heats of Poor Conductors. W. G. Marley.. 3667
Griffin-Sutton Combustion Bomb for Fuels. T. Carlton-Sutton........ 4572
Calorimeter for Heats of Fusion. F. D. Rossini 4963
See also 276, 277, 1931, 2467, 4569, 4590 *under* 1 (*a*) ; 280, 2469, 2619, 3663 *under* 1 (*b*).

Calorimetry, *continued.*

4. Unclassified.

Abstract Nos.

Infra-Red Absorption Spectrum of Nitrogen Tetroxide. G. B. B. M. Sutherland 4104

Colloids.

1. Theory.
2. Sols:
   (a) Preparation and Chemical Composition.
   (b) Electrical Properties (Coagulation, Cataphoresis, Electroosmosis, etc.).
   (c) Optical Properties.
   (d) Viscosity and Mechanical Properties.
3. Gels:
   (a) Formation and Composition.
   (b) Optical Properties.
   (c) Viscosity and Mechanical Properties.
3. Gels (*contd.*):
   (d) Swelling, Shrinking, Synaeresis.
   (e) Structure.
   (f) Membranes.
4. Fibres.
5. Emulsions and Suspensions.
6. Apparatus and Technique.
7. Unclassified.

Cross-References:
Adsorption Phenomena, *see* Adsorption.
Brownian Motion, *see* Kinetic Theory of Matter, 5.
Surface Tension Phenomena, *see* Surface Tension.

1. Theory.

Orientation and Deformation of Disperse Particles in Streaming Liquids. W. Haller 11
Mechanics of Gelation. E. G. Richardson 2116
Electrical Adsorption and Stability of Colloids. A. Ganguli 3278
Continuity of Phases during Sol-Gel Transformation. S. Prakash 4724
See also 3886 *under* 2 (*b*); 834, 835, 836, 837 *under* 3 (*f*).

2. Sols.

(*a*) *Preparation and Chemical Composition.*
Influence of Foreign Substances on the Cohesion Limits and Ultramicroscopic Sol-Formation of Synthetic Rock-Salt Crystals. Part III. Heavy Metal Chlorides. W. Metag. Part IV. Density Determinations. J. Köhler 40
Preparation of Colloids by Ultrasonic Dispersion. N. Marinesco 1674
Colloidal Sulphur. O. v. Deines 1675
Structure of Electro-Silver Sols. E. Einecke 2117
Aerosols, Especially Ferric Oxide. G. Jander and A. Winkel 2681
Preparation of Colloidal Solutions of Alkali Metals. M. I. Gen, I. L. Zelmanoff and A. I. Schalnikoff 3293
Ultrafiltration of Soap Solutions. J. W. McBain, Y. Kawakami and H. P. Lucas 3883

(*b*) *Electrical Properties* (*Coagulation, Cataphoresis, Electroosmosis, etc.*).
Variability of the Electrokinetic Jump in Potential. G. Ettisch and A. Zwanzig 12
Electrokinetic Phenomena. H. A. Abramson 13
Fundamental Assumptions and Equations of Electrokinetics. J. W. MacBain and M. E. Laing-MacBain 14
Electroosmosis and Electrophoresis. N. Schönfeldt 15, 1676
Isoelectric Point of Silk. M. Harris 16
Lyotropic Numbers and Properties of Ions. E. H. Buchner, A. Voet and E. M. Bruins 17
Theory of Surface Conductivity. J. J. Bikerman 350
Equal Electrical Conductivities of Moving and Stationary Surfaces: Laing Paradox. R. Dubois 351
Mechanism of Anomalous Osmosis. A. Grollman and K. Söllner 446
Influence of Time on the Conductivity of Colloids Measured at Different Levels. Papayanno 730
Ionic Interchange in Sulphur Sols. Lyotropic Series and Mechanism of Coagulation. T. R. Bolam and G. Bowden 825
Nature of Coagulation, Viscosity and Thixotropy in Colloidal Solutions. S. S. Kistler 826
Specific Conductivity of the Intermicellar Liquid of Gold Sols. R. Wintgen and W. Hacker 827
Filtration of (Hydrophobic) Colloids. May Annetts 828
Electrokinetics. Part XII. O. G. Jensen and R. A. Gortner 829
Correlation of Stream Potentials and Surface Conductance. H. L. White, F. Urban and E. A. van Atta 830

Colloids, *continued*.

Abstract Nos.

Application of the Double Layer Theory of Otto Stern. Part I. F. Urban and H. L. White ... 831
Dielectric Constant and Particle Size. J. W. Williams and J. L. Oncley ... 1174
Measurement of the Velocity of Gold Micelles by Observation of the Moving Boundary. W. Hacker ... 1262
Voltage Effect with Strong and Weak Bases. J. Schiele ... 1607
Cataphoresis. An Improved Cylindrical Cell. A. Mattson ... 1677
Electrochemical Experiments with Gum Arabic Sol. W. Pauli and Emmy Ripper ... 1678
Significance of Capillary Width for the Flow Potential. H. B. Bull ... 1765
Apparatus for Electrophoresis. (Miss) Choucroun ... 2118
Electrical Properties of Colloids. Parts I, II and III. I. N. Mukherjee 2119, 2682, 4727
Ionic Theory of Electroosmosis, Stream Current and Surface Conductivity. J. J. Bikerman ... 2120
Diffuse Double Layer. J. Lens ... 2121
Hydrogen Overvoltage and Structure of the Double Layer. A. Frumkin ... 2598
Kohlrausch-Weber Theory of the Migrating Boundary. W. Hacker ... 2683
Dependence of Electrokinetic Potential on Current Strength. N. Schönfeldt 2684
Combination of Silk and Wool with Positive and Negative Ions. M. Harris ... 2685
Effect of Radiation from Radioactive Substances on Flocculation of Colloids. A. Boutaric and Madeleine Roy ... 2686
Determination of Isoelectric Point. L. V. Andrews and D. J. Brown ... 3173
Migration Studies with Colloids. F. Hazel and D. M. McQueen ... 3294
Increase in Sensitivity of Photographic Emulsions by Electrophoresis. A. Charriou ... 3505
Electrical Conductivity of Capillary and Colloidal Systems. J. J. Bikerman ... 3884
Electroosmosis and Anomalous Osmosis. D. R. Briggs ... 3885
Cataphoresis. Part III. Comparison of the Results of Measurements by the Transport and Moving Boundary Methods, and a Theory of the Latter Method. D. C. Henry and J. Brittain ... 3886
Electrophoretic Behaviour of Lecithin and Certain Fats. C. W. Price and W. C. M. Lewis ... 3887
Cataphoretic Behaviour of Gas-Charged Carbon. A. Pilojan, N. Kriworutschko and Nathalie Bach ... 4725
Measurement of Cataphoretic Velocity. S. Komagama ... 4726
Electroendosmosis and Electrolytic Water-Transport. Part III. Solutions of Copper Salts. H. C. Hepburn ... 5043
Surface Oxides of Charcoal and Adsorption of Electrolytes. L. Lepin ... 5098
Ionic Adsorption at Metals and Charcoal. A. Frumkin ... 5099
Properties of the Double Layer and the Exchange Adsorption of Ions at Non-Metallic Surfaces. B. P. Nikolski ... 5100
Adsorption of Electrolytes and ζ-Potential. A. J. Rabinowitsch ... 5101
Capillary-Electrical Investigations on Silver Halogen Compounds. H. R. Kruyt ... 5109
Structure of the Electrical Double Layer. L. W. Janssen ... 5110
Electrophoresis of Lecithin in the Presence of Neutral Salt. C. W. Price and W. C. M. Lewis ... 5111
Cataphoretic Mobility of Adsorbed Proteins. A. Dummett and P. Bowden ... 5112
Phenomena in the Movement of an Electrode in an Electrolyte and Electrolytic Potential. M. O. Charmadarjan and B. I. Perwuschin ... 5429
See also 2681 *under* 2 (*a*); 2351 *under* 2 (*c*); 18, 832 *under* 2 (*d*); 2687 *under* 3 (*b*); 1358, 1359 *under* 3 (*f*); 1279, 1281 *under* 6.

(*c*) *Optical Properties.*

Tension Double Refraction of Colloids in Solution. W. Kuhn ... 19
Quantitative Interpretation of the Viscosity and Double Refraction of Flowing Suspensions. W. Kuhn ... 2122
Transversal Magneto-Optical Anisotropy of Vanadium Pentoxide Sols. W. Heller and H. Zocher ... 2351
Effect of Optical Constants upon the Mie Absorption Curves of Coloured Colloidal Systems. Part I. System Silver-in-Water. A. Krebs ... 3295
Double Refraction in Streaming Solutions of Molecular Colloids. R. Signer and H. Gross ... 3888
Diffraction at Small Spheres near the Focus of Convergent Spherical Waves. F. Möglich ... 4464
Streaming Double Refraction in Critical Liquid Mixtures. W. Ostwald and H. Erbring ... 4728

Colloids, *continued.*

Abstract Nos.

(*d*) *Viscosity and Mechanical Properties.*
Lyotropic Numbers and Viscosity. E. H. Büchner, E. M. Bruins and J. H. C. Merckel 18
Determination of the Magnitude, Shape and Solvation of Macro-Molecules. G. V. Schulz 20
Viscosity of Gelatin under X-Rays. Helen Q. Woodard 121
Viscosity and Molecular Weight. E. O. Kraemer and F. J. van Natta 823
Structural Viscosity in Lyophilic Sols. W. Gallay 832
Influence of Brownian Movement on the Viscosity of Suspensions. R. Eisenschitz 1679
Change of the Solvation Medium in Gelatin Sols. A. Sarluy 1680
Viscosity of Mixtures of Partially Miscible Liquids. Olive Oil-Water. R. Kremann, F. Griengl and H. Schreiner 1772
Influence of Slip on Viscosity of Suspension. R. Eisenschitz 2833
Anomalous Viscosity of Segregating Systems. Part I. Structural Viscosity of Liquid Mixtures at the Critical Point (of Miscibility). Part II. Structural Viscosity of Mesomorphic Melts. W. Ostwald and H. Malss.... 3385
Structural Viscosity and Elasticity in Molten Sulphur. W. Ostwald and H. Malss 3388
Viscosity of Colloids. I. Sakurada 3389
Viscosity and Elasticity of Sols. B. Rabinowitsch 4729
Viscosity of Solutions, in Particular of Solutions of Substances of High Molecular Weight. E. Guth and H. Mark 5189
See also 11, 2116 *under* 1; 19, 2122 *under* 2 (*c*).

3. Gels.

(*a*) *Formation and Composition.*
Calcium Acetate Gels. H. Henstock 4730
See also 1266, 1267, 1268 *under* 3 (*e*).
(*b*) *Optical Properties.*
X-Ray Studies on the Hydrous Oxides. Part I. Alumina. Part II. Stannic Oxide. Part III. Stannous Oxide. H. B. Weiser and W. O. Milligan 1112
Action of Ultra-Violet Radiation on Aqueous Solutions of Gelatin. P. Ponthus 2687
See also 833 *under* 3 (*c*); 838 *under* 3 (*f*); 1272 *under* 4.
(*c*) *Viscosity and Mechanical Properties.*
Study of Gels by Physical Methods. E. Hatschek 833
Silicic Acid Gels. Part III. C. B. Hurd and D. H. Carver 2123
Mechanical Properties of Disperse Systems. Part I. Deformations of Building Ground by Pressure. G. I. Pokrowski and W. G. Bulytschew 4311
Elastic Properties of Glycerin-Gelatin Gels and of Gelatin Gels Hardened with Formaldehyde. E. Hatschek 4731
See also 2116 *under* 1; 4730 *under* 3 (*a*); 1271 ,1277, 4315 *under* 4; 1280, 4316 *under* 6.
(*d*) *Swelling, Shrinking, Synaeresis.*
Absorption and Classical Diffusion. A. T. McKay 47
Laws of Swelling. J. R. Katz 1263
Swelling of Plane Gelatin Plates. Interferometric Investigations. Part IV. P. Kornmann 2688
Kinematographic Analysis of Swelling in the Dark Field by means of the Micromanipulator. Part I. K. Hess and B. Rabinowitsch........ 4312
Swelling of Silica Gel. D. C. R. Bonnell........ 5113
Electrolytes and the Synaeresis of Silica Gels. Part V. D. C. R. Bonnell 5114
See also 1268 *under* 3 (*e*); 1274 *under* 4.
(*e*) *Structure.*
Periodic Precipitation of Silver Salts. Suzanne Veil........ 21
Particle Size Determination by Electron Diffraction. M. v. Laue........ 856
Action of Boundary-Surface Active Substances on the Formation of Crystals in Liesegang's Rings. Part III. Action of Adsorption Layers on the Disperse System. Nadine Serb-Serbina 1264
Causes of Thixotropy of Certain Sols. P. Bary 1265
Molecular Aggregation of Nitrocellulose. F. D. Miles........ 1266
Structural Variations in the Nitrocelluloses. M. Mathieu........ 1267
Constitution of the Keratin Molecule. J. B. Speakman and Mercia C. Hirst 1268
Periodic Precipitation of Mercuric Iodine. Suzanne Veil 1282

Colloids, *continued*.

Abstract Nos.

Rhythmic Precipitates. T. Isemura 1297, 2689
Rhythmic Crystallisation of Alkali Carbonates in the Presence of Gelatin. Suzanne Veil 1298
Rhythmic Precipitation in Stretched Gels. A. Boutaric and J. Ratélade 2127
Radiate Precipitation of Strontium Carbonate. Suzanne Veil 2690
Periodic Precipitation. R. Fricke 3890
Theory of Liesegang's Precipitates. H. Bauer 4313
Influence of the Reaction of the Medium at the Moment of Coagulation on the Structure of Silica Gel. Part I. M. O. Charmadarjan and W. K. Markow 4732
Discontinuous Diffusion in Gelatin. Suzanne Veil 5115
Structure of Thin Celluloid Films. Part I. E. T. Jones 5444
See also 1112 *under* 3(*b*) ; 1272, 1273, 1275 *under* 4.

(*f*) *Membranes*.

Mechanical Properties and Structure of Nitrocellulose Films. A. V. Blom 425
Viscose, Cellulose Acetate and Gelatin Film Technique. Marta Halama 426
Polyphase Equilibria in Systems which are Separated by Membranes. R. Eisenschitz 661
Films : Threads and the Science of Colloids. Wo. Ostwald 834
Films : Physics of Membranes. E. Manegold 835
Membrane Equilibria. F. G. Donnan 836
New Investigations on Unimolecular Surface Films. N. K. Adam 837
Investigations on Film Structures by Electrical and Optical Methods. E. K. Rideal 838
Direct Collodion Membrane. L. Michaelis 1270
Properties of the Becquerel Membranes. J. J. Bikerman 1358
Membrane Processes. K. Söllner 1359
Surface Films of Cellulose Derivatives on Water and Dyestuff Solutions. Part II. J. B. Harding and N. K. Adam 4314
See also 446 *under* 2 (*b*) ; 2693 *under* 6.

4. Fibres.

Crystalline Threads and Fibrous Forms of Aggregation. H. W. Kohlschütter 439
Fine Structure and Mechanical Properties of Fibres. H. Mark 1271
Relations between the Refractive Indices and the Behaviour of Cellulose Fibres. J. M. Preston 1272
Lattice Changes of Nitrocellulose. J. J. Trillat 1273
Electrical Resistance of Wool Fibres. M. C. Marsh and Kathleen Earp 1274
X-Ray Analysis of the Structure of Animal Hairs and other Protein Fibres. W. T. Astbury 1275
Physical Significance of Crimp or Waviness in Wool Fibre. S. G. Barker 1276
Tensile Properties of Silk Filaments. W. S. Denham and T. Lonsdale 1277
X-Ray Fibre-Diagrams of Cellulose. W. Schramek 2124
X-Ray Fibre-Diagrams of Cellulose. K. Hess and C. Trogus 2691
X-Ray Study of Variations in the Structure of Wood Fibre Walls. C. W. Stillwell 2692
Deformation Mechanism of Fibrous Materials. O. Kratky 4315
Physical Problems of Leather Manufacture. C. H. Spiers 5116

5. Emulsions and Suspensions.

Mercury Emulsion Prepared by Means of Ultrasonic Waves. H. B. Bull and K. Söllner 23
Distribution of Suspended Particles Under Gravity. C. M. McDowell and F. L. Usher 25
Theory of Emulsions. C. H. M. Roberts 840
Formation of Emulsions by Supersonic Vibrations. W. Daniewski 2125
Formation, Size and Stability of Emulsion Particles. C. G. Sumner 2126
Flow of Liquid Suspensions. E. G. Richardson and E. Tyler 2246
Fluidities of Thixotropic Gels : Bentonite Suspensions. H. A. Ambrose and A. G. Loomis 3889
Viscosity of Emulsions. E. G. Richardson 5117
Mechanical Properties of Adsorption Layers, and Stability of Foam and Emulsions. D. L. Talmud 5118
See also 16 *under* 2 (*b*) ; 2122 *under* 2 (*c*) ; 1679, 2833 *under* 2 (*d*) ; 4315 *under* 4.

Colloids, *continued.*

6. Apparatus and Technique.

Abstract Nos.

Modified Electro Ultra-Filter. D. v. Klobusitzky 839
Sedimentation Equilibrium in the Ultra-Centrifuge: Types Obtained with Soap Solutions. J. W. and M. E. L. McBain 1278
New Investigations for the Measurement of the Migration-Velocity of Colloid Particles. W. Hacker 1279
Determination of Jelly-Strength and Modulus of Elasticity E_D of Glue Jellies and Influence of Additions of Viscosity and E_D. E. Goebel 1280
Method for the Separation of Different Disperse Systems by Cataphoresis. Bennhold 1281
Pore Distribution and Filter Action of Ultra-Filters and Animal Membranes. M. Pisa 2693
Determination of Pore Distribution According to Dimensions in Filters and Ultra-Filters. F. Erbe 3309
High-Speed Centrifuge. W. D. Garman 3891
Properties of Gelatin in the Electric Field. Suzanne Veil 4316
Ultra-centrifuge. J. W. Beams, A. J. Weed and E. G. Pickels 5119
See also 2117, 2681, 3883 *under* 2 (*a*); 827, 829, 1677, 2118, 3886 *under* 2 (*b*); 1112 *under* 3 (*b*); 833 *under* 3 (*c*); 2688, 4312 *under* 3 (*d*); 1277, 2124 *under* 4; 2246, 3889 *under* 5.

7. Unclassified.

Liquid Sodium Amalgams. G. R. Paranjpe and R. M. Joshi 22
Calculation of the Molecular Weight of a Polar Colloid from Dielectric Dispersion Curves of its Aqueous Solution. B. M. Bloch and J. Errera 24
Mechanical Stress in Electrolytic Copper Deposited in Presence of Colloids. P. Jacquet 743
Linear Phenomena. Part I. D. L. and B. A. Talmud and S. E. Bresler 1245
Diffusion of Colloidal Electrolytes: Sodium Oleate. M. E. L. McBain 1703
Adsorption and Solution Volume. Part II. Dependence of the Ionic State on Dilution. E. Ivanova and A. Rabinerson 2665
Adsorption in Solutions and Physical Properties of the Solvent. Part II. E. Heymann and E. Boye 2667
Are Liquid Sodium Amalgams Colloidal? H. E. Bent 2826
Decomposition of Complex Molecules by Means of Supersonic Waves. A. Szalay 3716
Lower Limit of the Particle Size in Disperse Systems. Gogoberidze 5120
Preparation and Properties of Thin Lead Sulphide Layers with Special Consideration of their Detector Action. Part I. G. Brückmann 5410

Colorimetry.

1. Theory.
2. Apparatus and Technique.
3. Unclassified.

Cross-References:
See also Vision, 1 and 2.

1. Theory.

Proposed Scale for Specifying the Chromaticity of Incandescent Illuminants and Various Phases of Daylight. I. G. Priest 1866
Colour Description. E. Haschek and M. Haitinger 2348

2. Apparatus and Technique.

Heterochromatic Measurements with the Pulfrich Photometer. E. Mayer 197
Colour Definition by the Duboscq Colorimeter. P. Woog and R. Sigwalt 998
Saturation Scale for Yellows. D. B. Judd 1846
Sensibility to Colour Temperature Change as a Function of Temperature. D. B. Judd 1917
Chromaticity Sensibility to Wave-Length Difference as a Function of Purity. E. P. T. Tyndall 1918
Optically Stable Sugar Solutions for Colorimetric Analysis. J. F. Brewster and F. P. Phelps 2349
Duboscq Instrument for Colorimetry, Nephelometry and Colorimetric Determination of Hydrogen-Ion Concentrations. J. Grant and J. H. W. Booth 2350
Trichromatic Colorimeter. H. P. J. Verbeek 2937

Colorimetry, *continued*.

Abstract Nos.

Photoelectric Instrument for Comparing the Strengths of Coloured Solutions. E. W. H. Selwyn 2938
Neutral Grey Liquid Filter. E. Landt 2939
Neutral Grey Liquid Filter. A. Thiel 2940
Textile Mutochrome. C. F. Smith 2973
Measurability of Sensations of Hue, Brightness or Saturation. L. F. Richardson 3621
Measurement of Visual Sensations. N. R. Campbell 3622
Conditions for Securing Accuracy in Spectrophotometry. F. Twyman and G. F. Lothian 4474
1931 I.C.I. Standard Observer and Co-ordinate System for Colorimetry. D. B. Judd 4867
Applications of Rectifier Photoelectric Cells in Photometry. B. Lange 4892
See also 2348 *under* 1.

3. Unclassified.

Colour of Silver as a Function of its Surface Condition. A. Kutzelnigg 181
Analytic Colour Tone Chart. R. D. Rusk 2941
Colour Harmony. J. Littlejohns 2942

Comets and Meteors.

1. Comets:
(*a*) Orbits.
(*b*) Spectra.
1. Comets (*contd.*):
(*c*) Unclassified.
2. Meteors.

1. Comets.

(*a*) *Orbits.*

Motion of the Periodic Comet Kopff. (1906 *e*.) Part I. F. Kepinski 124
Stellar Perturbations of Nearly Parabolic Orbits. E. Öpik 125
Average Diminution of Major Axis in the Capture of Parabolic Comets by Major Planets. J. Bosler 126
Definition Orbit of Comet 1911*b* (Kiess). L. Lindsey 910
Orbital and Velocity Variation of Halley's Comet and Its Distance from Perturbing Planets. A. Cabreira 911
Hyperbolic Orbits, Determination of True Anomaly and Time of Perihelion Passage. M. Davidson 917
Orbit of Comet 1917 I. (Mellish). S. Asklöf 1365
Calculation of Ephemerides in nearly Parabolic Orbits. J. P. Möller 5199
See also 1775, 5197 *under* 2.

(*b*) *Spectra.*

Origin of Continuous Cometary Spectra. W. M. Cohn 912
Spectrum of Comet 1911 V (Brooks) on Moscow Observatory Spectrograms. S. Vsessviatsky 2843

2. Meteors.

Ephemeris of Leonid Meteors Radiant Point. A. King 913
Determination of Meteoric Trajectories. V. G. Siadbey 914
Indian Meteorites. G. A. Silberrad 915
Theoretical Frequency Distribution of Photographic Meteors. P. M. Millman 1774
Meteor Orbits Connected with Comet Pons-Winnecke. F. W. Smith 1775
Newton-Denning Method of Computing Meteor Paths with Celestial Globe. W. J. Fisher 1776
Study of Meteor Light Curves. D. Hoffleit 1777
Observations of Leonids at Helwan Observatory, 1932, November. P. A. Curry 2249
Meteorites and the Age of the Universe. E. Öpik 2250
Origin of Tektites. L. J. Spencer 2251
Penetration of Iron Meteorites into the Ground. W. J. Fisher 2844
Meteor Spectra. P. M. Millman 3399
Leonid Meteors of 1932. C. P. Olivier 4794
Meteor Shower of 1933 October 9. E. Esclangon 5197
See also 125 *under* 1 (*a*).

Conduction (Electric) and Discharge in Gases.

1. Theory.
2. Conduction at Higher Pressures (Order of one Atmosphere). Spark and Arc. Mobility of Ions. Recombination of Ions.
3. Low-Pressure Discharge. Theory. Dark Space. Kathode Fall of Potential. Negative Glow. Positive Column. Electrodeless Discharge.
4. Measurement of *e*/*m* of Ions.
5. Ionisation by Electron Impact. Critical Potentials.
6. Ionisation by Collision with Atoms and Ions.
7. Ionisation by Chemical Action. Ionisation by Splashing.
8. Positive Rays (Canal Rays). Anode Rays.
9. Kathode Rays. Lenard Rays.
10. Chemical Effects of Discharge.
11. Apparatus and Methods of Measurement.
12. Unclassified.

Cross-References:
Artificial Disintegration of Nuclei, *see* Atomic and Molecular Structure, 2.
Auto-Electronic Emission, *see* Thermionics, 4.
Diffraction, Scattering, Reflection, etc. of Electrons, *see* Electrons, Positrons and Protons, 3.
Electric Breakdown, *see also* Section B.—Electrical Engineering.
Ionic Oscillations, *see* Oscillations, Electric, 1.
Ionisation by α-Rays, *see* Radioactivity, 4.
Ionisation by X-Rays, *see* X-Rays, 3.
Luminous Effects, Radiations, *see* Spectroscopy.
Measurement of *e*/*m* of Electrons, *see* Electrons, Positrons and Protons, 2.
Ramsauer Effect, *see* Electrons, Positrons and Protons, 3.
Secondary Electronic Emission, *see* Electrons, Positrons and Protons, 3.

1. Theory.

Abstract Nos.
Gas Discharges with Two Different Negative Characteristics. F. M. Penning 322
Starting of Gas Discharges. W. Rogowski 688
Physical Basis of Grid Control of Gas Discharges. A. Glaser 689
Energy Conditions of Gas Discharges. M. Steenbeck 690
Electrical Conductivity of Ionised Gas in the Presence of a Magnetic Field. T. G. Cowling 1153
Flow of Electric Current in Semi-Infinite Stratified Media. L. V. King 2005
Mechanism of the Liberation of Electrons at the Kathode Spot of an Arc Discharge. F. Lüdi 3728
See also 5395 *under* 2; 691, 1587, 3727, 4610 *under* 3; 2547, 2548 *under* 11.

2. Conduction at Higher Pressures (Order of one Atmosphere). Spark and Arc. Mobility of Ions. Recombination of Ions.

Momentum Relations in Crossed Fields. L. Page 130
Electric Sparks, Part III. T. Kobayasi 323
High Current-Density Glow Discharge at Atmospheric Pressure. H. Thoma and L. Heer 324
Electric Currents from Glowing Kathodes in Gases and Vapours at Atmospheric Pressure. M. Ruhnke 325
Mobility of Alkali Ions in Gases. C. F. Powell and L. Brata 326
Effect of Humidity and Temperature on Discharge Characteristics of Electrical Precipitators. S. P. Zebrowski 327
Kathode Material and Discharge Delay. R. Strigel 692
Electron Diffusion, Electron Attachment and Ageing of Negative Ions in Commercial Nitrogen at Atmospheric Pressure. J. Zeleny 693
Non-Existence of Ion Mobility Spectrum in Air. R. N. Varney 694
Liberation of Electrons from a Metal under Bombardment by Slow Positive Ions. G. Valle 695
Pole Effect of Iron. Magdalena Adam 1036
Time-Lag in the Commencement of the Discharge in a Hot-Kathode Tube at Low Gas Pressures. W. Koch 1154
Optical Investigations of Discharges with Condensed Sparks in Rarefied Gases. N. Ryde 1155
Accommodation Coefficient of Gaseous Ions at Kathodes. K. T. Compton 1156
Mobilities of Molecular Aggregates in Gases Containing Radon. E. L. Harrington and E. O. Braaten 1421
Discharge in Gases at Normal Temperatures and Pressures. J. D. Stephenson 1578
Electric Currents from Glowing Kathodes in Gases and Vapours at Atmospheric Pressure. T. V. Ionescu 1579
Electric Spark and its Preliminary Discharges. A. v. Hippel 1580
Glow Discharge at Atmospheric Pressure. W. Krug 1581

Conduction (Electric) and Discharge in Gases, ***continued.***

Abstract Nos.

Mobilities of Gaseous Ions in CH$_3$NO$_2$-H$_2$ and CH$_3$CN-H$_2$ Mixtures. Elizabeth A. Higley and Carolyn C. Thorsen 1582
Photoelectric Effect of Electric Spark Radiation. J. Meiklejohn 1655
Theories of Electrical Discharges in Gases at Normal Pressures and Temperatures. J. D. Stephenson 1984
Electrical Diffusion of Unipolar Ions in Gases. N. Wolodkewitsch.......... 1985
Multiply Charged Large Ions. J. J. Nolan and J. G. O'Keeffe 2301
Discharge in Air at Atmospheric Pressure in a Homogeneous Electric Field. R. Strigel 2522
Theory of Oscillatory Condenser Discharge. J. Thomson 2523
Absorption of Energy in Ionised Gases. T. V. Ionescu and Irène Mihul 2524
Development of Space Charge at a Spark-Gap with Surge Potentials. J. J. Sämmer 2525
Field Distortion at a Plane Spark-Gap Maintained at Constant Potential, due to the Passage of an Ionising Electron Layer. J. J. Sämmer 2526
Temperature Measurements in an A.C. Carbon Arc. E. F. Richter 2527
Electric Arc between Metal Electrodes. T. Toniszewski and T. Maciejewski.. 2528
Arcs in Air between Metallic Electrodes. H. Dziewulski 2529
Control of Ignition-Coil Discharge Characteristics. G. I. Finch and R. W. Sutton 2628
Controlled Dark Discharge in Free Air. A. Gemant.......... 3132
Characteristic of Carbon Arc in Chlorine. W. Kangro and E. Jeep 3133
Periodic Course of the Gas Temperature in the Column of an A.C. Air Arc Light. A. v. Engel and M. Steenbeck 3134
Characteristics of A.C. Arcs between Metal Electrodes. J. J. Sommer and J. Bott 3135
Heavy-Current Arc in a Magnetic Field. J. Roliński 3136
Effect of Water Vapour on Diffusion Coefficients of Ions in Nitrogen and Oxygen. J. J. Nolan and A. C. Galvin 3137
Corona Currents in Electro-Filters. W. Deutsch 3729
Unipolar Form of Surface Corona. A. Coehn and W. Ziegler.......... 3730
Light Emission from Electric Spark. M. Kornetzki, V. Fomin and R. Steinitz 4066
Electric Breakdown of Gases at Normal Pressure. J. J. Sämmer 4193
Emission of Metallic Ions from Oxide Surfaces. Part I. Identification of Ions by Mobility Measurement. L. Brata 4297
Emission of Metallic Ions from Oxide Surfaces. Part II. Mechanism of Emission. C. F. Powell and L. Brata 4298
Corona Discharge in Noble Gases. F. M. Penning, J. Moubis and C. C. J. Addink.......... 4609
Mechanism of Spark Discharge. A. Nukuradse 4611
Return Arc as Breakdown in Strongly Ionised Gas. G. Timoshenko.......... 4612
Electrical Diffusion of Ions in Gases of Bipolar Charge. N. Wolodkewitsch.... 4613
Mobility of Positive Ions in Gases. T. Edqvist.......... 4614
Sparks in Air of Atmospheric Pressure. G. Holst.......... 5001
Nature of Gas Ions. O. Luhr 5008
Models Illustrating the Theory of Electric Breakdown and Discharge in Gases. W. Rogowski and W. Fucks 5394
Theory of the Arc Discharge. R. Seeliger and K. Bock 5395
Glow Discharge at Atmospheric Pressure. H. Thoma and L. Heer 5396
Induction Coil Discharge. W. McFarlane.......... 5464

See also **331, 2521, 2531, 2537, 5003 *under* 3; 1590 *under* 5; 713, 715, 2547, 2548, 3155, 4621 *under* 11.**

3. Low-Pressure Discharge. Theory. Dark Space. Kathode Fall of Potential. Negative Glow. Positive Column. Electrodeless Discharge.

Recombination Spectrum of the Positive Column in Metal Vapours with Doublet Series. H. Krefft 230
Optical Determination of Temperature in Discharge Tubes. L. S. Ornstein and P. J. Haringhuizen 328
Cold Electric Arc in Vacuum. F. H. Newman.......... 329
Spectroscopic Examination of Metal Electrodes in Vacuum Arcs. F. H. Newman 330
Collisions of the First and Second Kinds in the Positive Column of a Caesium Discharge. F. L. Mohler 331

Conduction (Electric) and Discharge in Gases, *continued.*

Abstract Nos.

Potential Gradient in the Positive Column of a Mercury-Vapour Discharge. W. Elenbaas ... 332
Spontaneous Generation of Oscillations in Low-Pressure Discharges. S. K. Mitra ... 399
Theory of Electric Arc Plasma. D. Gábor ... 691
Hittorf Dark Space and First Kathode Layer of a Glow Discharge. W. Weizel 696
Cold Kathode Vacuum Arc. F. H. Newman ... 697
Mercury-Arc Phenomena. J. Kömmnick ... 698
Potential Gradient in the Positive Column in the Rare Gases. A. Lompe and R. Seeliger ... 699
Energy Balance in the Positive Column of a Discharge in Sodium Vapour. M. J. Druyvesteyn ... 700
Mobile Layers in the Positive Column of the Inert Gases. W. Pupp ... 701
Velocity Distribution among Electrons in the Positive Column. M. J. Druyvesteyn ... 702
X-Ray Study of the Density Distribution in a Discharge Tube. Y. Ishida and T. Suetsugu ... 703
Investigation of Mercury-Vapour Discharges. E. Lübcke ... 704
Ionised Gases in the Magnetic Field; Pressures less than 10^{-3} mm. of Mercury. T. V. Ionescu and C. Mihul ... 705
Kathode Sputtering. F. H. Newman ... 1157
Contribution of Positive Ions to the Space-Current in the L.V. Arc. A. Gehrts and H. Vatter ... 1158
Spectral Zones in Front of the Kathode in Glow Discharges. A. Güntherschulze and F. Keller ... 1159
Spectroscopic Applications of the Electrodeless Discharge. G. Déjardin ... 1484
H.F. Discharge in Helium and Mercury. E. Matuyama ... 1485
Ignition Potentials in Noble Gases in Presence of Hg Vapour. B. Klarfeld ... 1583
Neutralisation and Ionisation of High-Velocity Ions of Neon, Argon and Krypton by Collision with Similar Atoms. H. F. Batho ... 1585
Positive Ion Current at the Kathode in the Glow Discharge. A. K. Brewer and R. R. Miller ... 1586
Development of the Maxwellian Distribution in Langmuir's Plasma. D. Gábor 1587
Positive Column Phenomena. H. Wulfhekel and R. Seeliger ... 1588
Surface Motion of Sputtered Particles. R. W. Ditchburn ... 1589
Adsorbed Caesium Films on Tungsten. I. Langmuir ... 1668
Activation of Air by the Electrodeless Ring Discharge. B. Arakatsu and K. Kimura ... 1986
Electrodeless Ring Discharge Through Potassium Vapour. B. Arakatsu and Y. Uemura ... 1987
Moving Striation and Anode Spots in Neon Tubes. T. Takamine, T. Suga and A. Yanagihara ... 1988
Control by an External Magnetic Field of the Current Across a Spark-Gap. R. F. Earhart and H. A. Carlock ... 1989
Influence of Axial Magnetic Fields on the Positive Column of Mercury-Vapour Arcs. G. A. Kugler and A. Roggendorf ... 1990
Effect of Steepness of A.C. Potential Rise on the Ignition Potential of the Rare Gases and Air in Discharge Tubes. W. Spielhagen ... 1991
Ignition Potential of Nitrogen with Varying Electrode Distance. H. Fricke 1992
Ionisation and Scattering Accompanying Position Ion Impact in Gases. C. A. Frische ... 1993
Momentum Transfer to Kathode Surfaces by Impinging Positive Ions in Helium Arc. E. S. Lamar ... 1994
Electrodeless Discharges in Uniform Fields. G. D. Yarnold ... 1995
Electron Rays and Gas Discharge. E. Brüche ... 1996
Colour in Films of Sputtered Tin. C. J. Overbeck ... 2361
Moving Striæ in Neon. W. J. Oosterkamp ... 2521
High-Velocity Vapour Stream in the Vacuum Arc. R. C. Mason ... 2530
Density Distribution of Unipolar Ionic Currents. W. Deutsch ... 2531
Scattering of Electrons by Ions and the Mobility of Electrons in a Cæsium Discharge. C. Boeckner and F. L. Mohler ... 2532
Distribution of Space Charges in the Mercury-Vapour Arc. J. Pawlikowski 2533
Gradients of the Glow Discharge in Wide Discharge Vessels and in Tubes. The Term "Normal Gradient." A. Güntherschulze and H. Betz ... 2534
Glow Discharge in Highly Dried Molecular Gases. A. Güntherschulze and F. Keller ... 2535

For the **Key** to this Index see pp. 1358 to 1372.

Conduction (Electric) and Discharge in Gases, *continued*.

Abstract Nos.
Deposits of Metallic Mercury by H.F. Discharge. D. Banerji and R. Ganguli 2536
Electrodeless Discharges in Argon. Part I. Electrical Properties. S. P. McCallum and L. Klatzow 2537
Crystalline State of Thin Sputtered Films of Platinum. G. P. Thomson, N. Stuart and C. A. Murison 2696
H.F. Discharge in Gases. J. C. Wilson 3138
Anode of the Glow Discharge. A. Güntherschulze and F. Keller 3139
Theory of Positive Column. M. J. Druyvesteyn 3140
Uniform Positive Column. F. L. Jones 3141
Kathode Disintegration of Platinum by Mercury Ions. J. E. Henderson and Edith Gideon 3142
Influence of a Magnetic Field on Anode Spot. T. Takamime, T. Suga and A. Yanagihara 3143
Theory of Glow Discharge. W. Rogowski 3727
H.F. Spectrum of Argon in Presence of Mercury. R. Zouckermann 3537
Emission of Light from a Gaseous Mixture. W. Uyterhoeven, J. Bruynes and C. Verburg 3539
Light Emission from Discharge Tubes. H. Krefft, M. Reger and R. Rompe 3540
Intensity of Spectral Lines in the Glow Discharge of the So-Called Multi-Coloured (Bunt) Hydrogen. A. Güntherschulze and H. Betz 3552
H.F. Discharge in Gases. T. V. Ionescu and Irène Mihul 3731
Ignition Conditions of Low-Voltage Arcs and Grid-Controlled Low-Voltage Arcs. F. Klaiber 3732
Structure of Magnesium, Zinc and Aluminium Films. G. I. Finch and A. G. Quarrell 3895
Catalytic Properties and Structure of Metal Films. Part I. Sputtered Platinum. G. I. Finch, C. A. Murison, N. Stuart and G. P. Thomson 3896
Recombination Radiation in the Cæsium Positive Column. F. L. Mohler 4106
Deposition of Sputtered Films. R. W. Ditchburn 4194
Ionisation of Air and Hydrogen in H.F. Discharge. T. V. Ionescu and Irène Mihul 4195
H.F. Discharge. (Miss) M. Chenot 4196
H.F. Discharge in Argon. Part II. Spectral Properties. S. P. McCallum, L. Klatzow and J. E. Keyston 4197
Electrostatic Theory of the Plasma. D. Gábor 4610
Physical Processes in the Mercury Arc at Low Pressures. E. Lübcke 4615
Positive Column in Hittorf Dark Space. A. Güntherschulze and H. Betz 4616
Effect of Positive Space Charge in Collector Analysis of Discharges. R. H. Sloane and K. G. Emeléus 4617
Maintenance Potential of Glow Discharge in Air. E. L. E. Wheatcroft 5002
Glow Discharge over a Wide Pressure Range. A. v. Engel, R. Seeliger and M. Steenbeck 5003
Effect of Inductance on the Intermittent Glow Discharge. W. E. Kock 5004
Electrical and Optical Measurements in H.F. Gas Discharges. L. Rohde and H. Schwarz 5005
Interference of Light in Metallic Films. J. B. Nathanson 5276
Vapour Stream in Vacuum Arcs. R. C. Mason 5397
Influence of the Anode on the Stability of Discharges in Argon. W. Pupp 5398
Studies of Rare Gas-Sodium Arcs with the Use of Collectors. T. Harada 5399
See also 1154, 1155 *under* 2; 5014 *under* 10; 2545, 3747 *under* 11.

4. Measurement of *e/m* of Ions.

See also 4618 *under* 5.

5. Ionisation by Electron Impact. Critical Potentials.

Asymptotic Integration of the Differential Equation Relating to the Thomas-Fermi Atom. A. Sommerfeld 95
Intensities of Spectral Lines of He, Hg and N_2 Excited by Electron Bombardment. O. Thieme 235
Excitation and Emission of Light in the Hydrogen Spark at High Pressures. W. Finkelnburg 591
Classification of the Spectral Lines of Cl V and Cl IV. S. C. Deb 597
Excitation by Collision with Electrons, Ions and Atoms. W. Hanle and K. Larché 598

Conduction (Electric) and Discharge in Gases, *continued*.

Abstract Nos.
Analysis of Lanthanum Spectra LaI, LaII and LaIII. H. N. Russell and W. F. Meggers 599
Behaviour of Electrons in Nitrous Oxide. V. A. Bailey and J. B. Rudd 1160
Ionisation of Gases by Electrons at High and Low Pressures. K. Masch 1161
Proposed Unit for Ionisation Intensities in Gases. W. Kolhörster 1162
Applications of the Method of Impact Parameter in Collisions. E. J. Williams 1342
Relation between Ionisation and Ionisation Current in Gases at High Pressures. W. R. Harper 1590
Collision of Slow Electrons with Atoms. Part II. General Theory and Inelastic Collisions. Part III. Excitation and Ionisation of Helium by Electrons of Moderate Velocity. H. S. W. Massey and C. B. O. Mohr 1631, 3800
Higher Ionisation Potentials of Atoms According to the Thomas-Fermi Model. A. Sommerfeld 1756
Arc Spectrum of Iodine. S. C. Deb 1880
Mass-Spectrograph Study of the Ionisation and Dissociation by Electron Impact of *n*-Octane. E. G. Linder 1997
Ionisation of Sulphur Dioxide by Electronic Impact. H. D. Smyth and D. W. Mueller 2539
Probability of Excitation of Helium 2^1 P at Zero Angle. J. E. Taylor and R. Whiddington 3021
Excitation Potentials of Beryllium. H. W. B. Skinner 3144
Excitation Potentials of the Argon Atom. R. G. Loyarte 3145
Ionising Potentials for Atoms and Ions of Rare Gas Type. J. A. Wasastjerna 3146
Light Yield Measurements in the Sodium Spectrum by Excitation by Means of Electron Bombardment. G. Haft 3551
Excitation Potential of the λ 2883 and λ 2895 Bands of CO_2. A. S. Roy and O. S. Duffendack 3733
Quantum Mechanical Cross-Section for Ionisation of Helium by Electron Impact. W. W. Wetzel 3734
Quantitative Determination of the Excitation Functions of some Terms of the Mercury Atom. R. Seiler 4095
Formation of Negative Ions in Mercury Vapour. U. Stille 4618
Ionisation Potential and Formation of the Hydrogen Molecule. J. Savard 4619
Optical and Ultra-Ionisation Potentials of Mercury. R. G. Loyarte and Margarita de Bose 4620
Effect of Light on Rubidium Iodide Vapour. M. S. Desai 4882
Second Spectrum of Krypton. T. L. de Bruin, C. J. Humphreys and W. F. Meggers 4916
Excitation of Band Systems. L. S. Ornstein and G. O. Langstroth 4944
Excitation Probabilities of He, A and Ne at Zero Scattering Angle. J. E. Taylor and R. Whiddington 5006
Energy Losses of Slow Electrons in Nitrogen. G. W. Brindley 5007
New O_2^+ Bands. Dissociation Energy of O_2^+ and Ionisation Potential of O_2. R. S. Mulliken and D. S. Stevens 5329
Theory of the Stoppage of Fast Electrons. S. Flügge 5400
Influence of Space-Charge Effects in Measurement of Excitation Functions. J. M. W. Milatz 5401
Arrangement for Determining the Resonance Levels of Mercury. G. Mönch 5402
See also 329, 330, 701, 4197 *under* 3; 1584, 2538, 2602 *under* 6.

6. Ionisation by Collision with Atoms and Ions.

Ionisation of Helium, Neon and Argon Under Impact of Their Own Atoms and Positive Ions. C. J. Brasefield 333
Ionisation by Metastable Neon Atoms Formed by Resonance Radiation. F. M. Penning 1584
Ionisation by Positive Ions. J. S. Townsend and F. L. Jones 1998
Ionisation of Water Vapour by Ionic Impact. H. D. Smyth and D. W. Mueller 2538
Some Factors Affecting Cross-Section for Collisions of the Second Kind between Atoms and Ions. O. S. Duffendack and K. Thomson 2602
Ionisation of Argon, Neon and Helium by A, Ne and He Atoms. C. J. Brasefield 3147
Ionisation of Mercury Vapour by Positive Ions. R. M. Chaudhri 4198

Conduction (Electric) and Discharge in Gases, ***continued.***

Abstract Nos.

Limitation in Currents of Positive Alkali Ions of Homogeneous Velocities. P. Keck and L. B. Loeb **4707**
Passage of Positive Ions through Gases. H. S. W. Massey and R. A. Smith .. **5009**
Positive Ion Excitation of Mercury Vapour. E. J. Jones **5403**
Collision Effects of Slow Positive Ions in Inert Gases. M. Nordmeyer **5404**
See also **3728** ***under*** **1 ; 695** ***under*** **2 ; 1993** ***under*** **3 ; 598, 1590, 2539** ***under*** **5.**

7. Ionisation by Chemical Action. Ionisation by Splashing.

See also 1582 *under* 2.

8. Positive Rays (Canal Rays). Anode Rays.

New Method of Mass Spectrometry. J. Mattauch **706**
Special Method for the Production of Positive Rays. W. Reusse **707**
Loss of Energy of Slow Positive Rays in their Passage through Matter. W. Reusse **708**
Energy Exchanges in Corpuscular Collisions. R. Döpel **1629**
Negatively Charged H. Atoms from Light Emission in the Photographic Region. R. Döpel **2541**
Mass-Spectrograph of the Parabola Type with Increased Sharpness of Line. H. Lukanow and W. Schütze **3148**
Isotopic Constitution and Atomic Weight of Lead from Different Sources. F. W. Aston **3281**
Atomic Disintegration by Proton Bombardment (Canal Rays). F. Kirchner **3476**
Detection of Impurities in Canal Rays by Electron Diffraction. H. Raether **3735**
Radiation from Canal Ray Impact. F. L. Verwiebe **3736**
Excitation of X-Ray by Collision of High-Velocity Positive Ions. K. Lion **4199**
Doppler Effect in Hydrogen at High Voltages. K. Lion **4200**
Excitation of Balmer Lines. F. Zimmer **4496**
Doppler Effect in Spectra of Positive Rays of Uniform Velocity in A Ne and He. Anna I. McPherson **5405**
Wide Angle Magnetic Spectrometer. C. D. Bock **5408**
See also **695** ***under*** **2 ; 1997** ***under*** **5 ; 4707** ***under*** **6 ; 1843, 3748** ***under*** **11.**

9. Kathode Rays. Lenard Rays.

Flexible Kathode Rays. E. Brüche **334**
Electron Microscope. M. Knoll and E. Ruska **335**
Emission Distribution at Glow Kathodes with the Magnetic Electron Microscope. M. Knoll, F. G. Houtermans and W. Schulze **336**
Kathode-Ray Oscillograph: Direct Records on Photographic Paper. W. Förster **338**
Low-Speed Braun Tube. G. Dobke **339**
Gas Concentration of Electron Beams. W. Rogowski and H. Graupner **709**
Space-Charge Field of Gas-Concentrated Electron Beams. K. Engel **710**
e/m Measurements of Filament Rays. K. Siebertz **711**
Kinematography of Oxide Kathodes Using the Electron Microscope. E. Brüche and H. Johannson **806**
New Investigations of Kathodes with the Electron Microscope. E. Brüche and H. Johannson **807**
Powerful Kathode-Ray Tube. Y. Cauchois **1165**
Theory of Geometric Optics for Electrons. J. Picht **1196**
Electric Electron Condensing Lens. H. Johannson and O. Scherzer **1591**
Theory of Electric Electron Condensing Lens. O. Scherzer **1592**
Fundamentals of Geometrical Electron Optics. E. Brüche **1999**
Theory of the Electron Microscope. L. Posener **2000**
Geometrical Optics of Electron Rays. W. Glaser **2001**
Motion of Electrons in Heterogeneous Magnetic Fields. H. Ertel **2542**
Paths of Electrons in Axially Symmetric Electric and Magnetic Fields. C. Störmer **2543**
Trajectory of Electrons in a Longitudinal Magnetic Field. B. Kwal **3149**
Optics of Braun L.T. Tube. E. Brüche **3150**
Geometrical Electron-Optics of the Axial-Symmetrical Electromagnetic Field. W. Glaser **3151**
Mobility of Electrically-Charged Carriers in Strong Electric and Magnetic Fields Simultaneously Applied. G. A. Kugler, F. Ollendorff and A. Roggendorf **3152**

Conduction (Electric) and Discharge in Gases, ***continued.***

Abstract Nos.

Geometrical Optics in Inhomogeneous Media. J. Picht **3527**
Probabilities of K-Electron Ionisation of Silver. D. L. Webster, W. W. Hansen and F. B. Duveneck **3652**
Theory of Gas-Focussing of Electron Streams. O. Scherzer **3737**
Influence of Nature of Gas on Focussing of Electron Streams. E. F. Richter .. **3738**
Theory of the Electron Microscope. W. Glaser **3739**
Formation of Pictures of Thin Sheets Traversed by Rays in the Electron Microscope. B. v. Borries and E. Ruska **3740**
Electron Optics. V. K. Zworykin **3741**
Theory of Electron Optics. J. Picht **3742**
Reflection of Kathode Rays at the Surface of a Single Crystal. S. Kikuchi and S. Nakagawa **3799**
Approximate Integration of the Equations of Motion of Electrons in the Field of a Magnetic Dipole. C. Störmer **4023**
Optical Imagery. J. Picht **4078**
Potential Theory Applied to the Wehnelt Cylinder. G. Wendt **4201**
Formation of Pictures of Surfaces Irradiated by Electrons in the Electron Microscope. E. Ruska **4202**
Focussing of Kathode-Ray Beams of Large Cross-Section. E. Ruska **4203**
Electron-Microscope Observations on the Barium Vapour-Deposited Kathode. E. Brüche and H. Johannson **4296**
X-Ray Line Intensities and Kathode-Ray Retardation in Thick Targets of Silver. D. L. Webster, W. W. Hansen and F. B. Duveneck **4556**
Electron-Ray Oscillograph. J. Dantscher **5010**
Electron Current Density in Kathode-Ray Tubes. F. Malsch **5011**
Current Measurement by means of the Kathode-Ray Oscillograph. A. Matthias, B. v. Borries and E. Ruska **5012**
Electron Microscope Pictures with Secondary Electrons. M. Knoll and G. Lubszynski **5013**
Anomalous Reflection of Fast Electrons at the Surface of a Single Crystal. S. Kikuchi and S. Nakagawa **5051**
Shape of an Electron Beam in a Magnetic Field. N. F. Barber **5057**
See also 1996 *under* 3; 1629 *under* 8; 1843 *under* 11.

10. Chemical Effects of Discharge.

Heterogeneous Chemical Reactions in the Silent Electric Discharge. Part I. S. Miyamoto (with T. Takakura) **337**
Ignition of Vapours by Electric Sparks. A. Kling and A. Soulier **712**
Highly Rarefied Flames of Potassium Vapour with Halogens. M. Krocsák and G. Schay **1163**
Activation of Molecular Oxygen by Electron Impact. G. Glockler and J. L. Wilson **1164**
Influence of Ionisation upon the Ignition Temperature of a Gas Mixture. B. Lewis and C. D. Kreutz **1548**
Spectroscopic Study of the Decomposition and Synthesis of Organic Compounds by Electrodeless and Glow Discharges. W. D. Harkins and J. M. Jackson **1593**
Silane Formation during Hydrogen Discharge. E. Hiedemann **2540**
Heterogeneous Chemical Reactions in the Silent Electric Discharge. Parts II, III and IV. S. Miyamoto **2544**
Heterogeneous Chemical Reactions in the Silent Electric Discharge. Part V. S. Miyamoto **3743**
Ignition of Explosives by Ion and Electron Impacts. H. Kallmann and W. Schränkler **3744**
Decomposition of Sodium Azide by Controlled Electron Bombardment and by Ultra-Violet Light. R. H. Müller and G. C. Brous **3745**
Recombination of Atomic Hydrogen into Molecules in the Tungsten Arc. F. J. Havlicek **3746**
Formation of Metallic Hydrides by Atomic Hydrogen. E. Pietsch **4204**
Atomic Chlorine. G. M. Schwab and H. Friess **4205**
Clean-up of Hydrogen by Magnesium. A. L. Reimann **4713**
Spark Ignition of Low Inflammable Gas Mixtures. Part II. Spectrographic Examination of the Ignition Spark. K. Yumoto **4978**
Reactions of the Hydroxyl Radical in the Electrodeless Discharge in Water Vapour. W. H. Rodebush and M. H. Wahl **5014**
See also 1581 *under* 2; 2535 *under* 3; 1864 *under* 11.

Conduction (Electric) and Discharge in Gases, *continued.*

11. Apparatus and Methods of Measurement.

Abstract Nos.
Self-Recording Cosmic-Ray Electrometer and Depth-Ionisation Curve. J. M. Benade 214
Possible Use of Very High Potentials in Discharge Tubes. M. Sitnikov 340
Valve Amplifier for Feeble Pulses. L. F. Curtiss 341
Optical Investigation of the Spark Flame in Air at Atmospheric Pressure Produced by an Impulse Generator. W. Holzer 713
Design of Pressure Ionisation Chambers. J. H. Williams 714
Lichtenberg Figures in Gases and Liquids. Y. Toriyama 715
Cosmic Rays. T. H. Johnson 1019
Researches upon the Isotopes of Oxygen, Neon and Chlorine. H. Kallmann and W. Lasareff 1258
Comparison of Methods for Counting the Ions in the Atmosphere. H. T. Graziadei 1401
Production and Application of Fast Corpuscular Rays (Artificial Disintegration of Atoms). A. Brasch 1843
Improvements in Microphotography with Ultra-Violet Light. A. Köhler 1864
Temperature Effect and its Elimination in Geiger-Müller Tube Counters. L. F. Curtiss 2002
Kinematographic Study of the Discharge through Discharge Tubes. V. Dolejšek and K. Dráb 2003
New Design for a H.T. Discharge Tube. L. C. van Atta, R. J. van de Graaff and H. A. Barton 2004
Electrostatic Production of High Voltage for Nuclear Investigations. R. J. van de Graaff, K. T. Compton and L. C. van Atta 2052
Advantages and Disadvantages of Small-Chamber Measuring Instruments. H. B. Hunt 2074
Apparatus for the Measurement of Radioactive Materials. A. Piccard and L. Meylan 2339
Design of an Apparatus for Kathode Sputtering. J. A. Darbyshire 2545
Circuit for Recording Multiply-Coincident Discharges of Geiger-Müller Counters. T. H. Johnson and J. C. Street 2546
Probe Measurements in the Sodium Arc. F. H. Newman 2547
Practical Methods of Starting the Conduction in Mercury Arcs. L. J. Buttolph and D. W. Dana 2548
Use of Argon in the Ionisation Method of Measuring Cosmic Rays and γ Rays. J. J. Hopfield 2993
Temporary Activation of Geiger-Müller Counters after Treatment with X-Rays. R. Brunetti and Z. Ollano 3153
Spread of the Discharge in Greiger-Müller Counters. E. Greiner 3154
Influence of the Walls on the Discharge of the Tube Counter. J. N. Hummel .. 3155
Application of the Electrometer Triode to the Measurement of Ionisation Current. J. A. C. Teegan and A. M. Hayes 3156
Electrometer Triode in the X-Ray Ionisation Spectrometer. W. A. Wooster and B. W. Robinson 3157
Radioactive Contamination of Ionisation Chamber Materials. J. A. Bearden .. 3467
Behaviour of Probes in Neon Discharge. E. Reichrudel and G. Spiwak 3747
Mass Spectrometer with Direction and Velocity Focussing. H. Bondy and K. Popper 3748
Simple Portable Wilson Chamber. K. Philipp and F. Dörffel 3749
Technique and Design of Wilson Cloud-Chambers. O. Dahl, L. R. Hafstad and M. A. Tuve 3750
Portable Double Geiger Counter. R. D. Bennett, J. C. Stearns and W. P. Overbeck 3751
H.T. Constant D.C. Generator. N. Mortara 3752
Impulse Generator Operating at Three Million Volts. d'Arsonval 3753
E.H.T. Production for Artificial Disintegration of Atomic Nuclei. J. M. Ledeboer 4037
Atomic Nucleus and High Voltages. M. A. Tuve 4038
New Experimental Arrangement for the Production of Fast Ions. H. Kallmann 4206
Vacuum Discharge with Internal Source of High Potential. W. Kossel and A. Eckardt 4207
Positive Lichtenberg Figures. S. Etinger 4208
Resistance-Coupled Amplifier for Measuring Ionisation Currents. L. F. Curtiss 4221
Improvement of Vacua by Electrical Discharges. W. v. Meyeren 4386

Conduction (Electric) and Discharge in Gases, *continued.*

Abstract Nos.

Improved Cosmic-Ray Meter. A. H. Compton and J. J. Hopfield 4486

Maintenance of a Constant Potential of about 1000 Volts by Means of a Positive Corona Discharge. A Portable Apparatus for the Operation of Tube and Point Counters. G. Medicus 4621

Mechanism of Geiger-Müller Tube Counters. W. Christoph and W. Hanle 4622

Combined Tesla Coil and Vacuum Tube. C. C. Lauritsen and R. Crane 4623

Correction of Previous Results on Nucleus Counting and Ionic Charge. H. Israël 4831

Effects of Turbulent Air-Flow in Apparatus for Atmospheric-Electric Measurements. O. H. Gish 4835

Dependence on Pressure of the Residual Ionisation in Cosmic-Ray Measurements. P. Pfundt 4903

Dependence on Pressure of the Residual Ionisation. E. Körner 4904

Pressure Dependence of the Residual Ionisation. J. A. Priebsch 4905

Cosmic-Ray Hodoscope. T. H. Johnson and E. C. Stevenson 4906

Wilson Chamber as a Counting Apparatus for α- and H-Rays. R. Trattner 5015

New Type of Expansion Apparatus. C. T. R. Wilson 5016

Extension of Limits of Application of the Duant Vacuum Electrometer. K. Diebner 5061

Large Plate Condenser Method of Measuring. Radioactive Substances. (Mme) P. Curie 5260

Short Wave Oscillator for Spectroscopy. H. Pettersson 5346

Effect of Internal Discharges on the Successive Functioning of the Geiger-Müller Tube Counter. R. Brunetti and Z. Ollano 5406

Proportional Amplifier for the Detection of Single Ionising Corpuscles. B. Zipprich 5407

See also 324, 327, 694, 1581, 1985, 2523, 3134, 3730, 4613 *under* 2; 701, 1157, 1989, 1990, 1993, 1995, 3138, 3142, 5003 *under* 3; 5401, 5402 *under* 5; 706, 707, 708, 2541, 5408 *under* 8; 1593, 4204, 4205 *under* 10.

12. Unclassified.

Ionisation of Gas in a Magnetic Field. T. V. Ionescu and C. Mihul 716

Behaviour of Neon Tubes in a Flashing Capacity Circuit. J. H. J. Poole 1594

Origin and Behaviour of Negatively Charged Metallic Particles in Electrical Discharges. K. Sommermeyer 4624

Conduction (Electric) in Solids and Liquids.

1. Theories.
2. Voltage Measurement (Apparatus and Methods).
3. Current Measurement (Apparatus and Methods).
4. Resistance Measurement (Apparatus and Methods).
5. A.C. Resistance, Skin Effect.
6. Effects of Temperature, Pressure and Mechanical Stress on Resistivity.
7. Surface Conduction. Contact Resistance (including Contact Rectifiers).
8. Special Effects (Supraconductivity, etc.).
9. Conductivity:
   (*a*) Metals, Alloys and Non-Metals.
9. Conductivity (*contd.*):
   (*b*) Liquids (including Solutions).
   (*c*) Dielectrics.
10. Unclassified.

Cross-References:

Effect of Magnetic Field on Resistance, *see* Galvanomagnetic and Thermomagnetic Effects.

Photoconductivity, *see* Photoelectricity, 4.

Rectifiers (other than Contact) and Rectification, *see* Oscillations, Electric, 3.

Single Crystals, Conductivity of, *see* Crystal Structure and Properties, 6.

Units of Measurement, *see* Mathematical Methods, etc., 3.

1. Theories.

Electron Theory of Metals. R. Peierls 717

Lorentz-Lorenz Correction in Metallic Conductors. R. de L. Kronig and H. J. Groenewold 718

Free Electrons in a Crystalline Lattice. Wave Equation and Magnetic Properties. L. Brillouin 893

Theory of Metals. Part I. A. H. Wilson 1166

Self-Consistent Fields and Free Electrons in Metals. Part III. L. Brillouin 1338

Theory of the Change of Electric Resistance in Metals Caused by Hydrostatic Pressure. K. Honda, T. Nishina and T. Hironé 1595

Diamagnetism of Conducting Electrons. R. Peierls 2063

Constitution of Metallic Sodium. E. Wigner and F. Seitz 2673

Conduction (Electric) in Solids and Liquids, *continued.*

Abstract Nos.

Theory of Metals. R. Peierls 3158
New Statistics and Electrostatics. M. K. Gopalaiengar 3806
Part Played by Protons in Electrical Conduction in Metals. Part III. Photographic Plate as Indicator. A. Coehn and K. Sperling 4209
Electronic Properties of Conductors and Insulators. R. H. Fowler 4210
Theory of Regular Mixed Phases. Part III. C. Wagner 4211
Theory of Thermoelements Composed of Semi-Conductors. C. Wagner 4212
Electrostatic Theory of the Fequency-dependence of Ionic Mobilities and Dielectric Constants in Mixed Solutions of Strong Electrolytes. H. Falkenhagen and W. Fischer 4239
Physical Significance of Apparent Irregularities in the Magneto-Resistance Curves of Nickel. M. M. S. Gupta and M. S. Alam 4669
Conservation Theorem of the Metallic State. F. Bloch 5409
See also 3760 *under* 7; 4627 *under* 8; 1170 *under* 9 (*c*).

2. Voltage Measurement (Apparatus and Methods).

H.T. Voltmeter for the Direct Measurement of Tube Voltage during Diagnosis and Therapy. K. W. Müller 791
Elimination of Disturbing E.M.F.s with Sensitive D.C. Measurements. L. Ebert and J. Lange 1171
Practical Valve Circuit for the Measurement of E.M.F. S. B. Ellis and S. J. Kiehl 2599
Electrical and Magnetic Measurements. G. Keinath 2631
Valve-Voltmeter for Measurements of Hydrogen-Ion Concentration. A. S. McFarlane 3159
Electrostatic H.T. Voltmeter. G. S. Field 3754
Measurement of Peak Values of Alternating Currents and Voltages by Means of Thyratron. E. Hughes 3755
Compensation Method for Accurate Measurement of High Voltages. E. Hess 4216
Use of Valve Electrometer with Extremely High Input Resistance. R. E. Burroughs and J. A. Ferguson 4217
Voltmeter Amplifier. J. Roulleau 4218
Improved Balanced Circuit for Use with Electrometer Tubes. L. A. Turner and C. O. Siegelin 4223
Direct Measurement of X-Ray Tube Voltage. F. D. Owen-King 4958
Maintenance Potential of Glow Discharge in Air. E. L. E. Wheatcroft 5002
Standard-Cell Comparator. H. B. Brooks 5017
Thermocouple Potentiometer. A. Egerton and A. R. Ubbelohde 5018
Electrostatic Generating Voltmeter. G. P. Harnwell, and S. N. van Voorhis 5064
Determination of High Potentials and High Potential Wave Forms. P. Kirkpatrick 5477

3. Current Measurement (Apparatus and Methods).

Galvanometer with Moving Magnets Rendered Astatic by a New Method. L. Meylan 353
Brownian Movement Limits for Series of Observations. F. Zernike 884
D.C. Amplifier with Good Operating Characteristics. A. H. Taylor and G. P. Kerr 1596
Amplifier for Photoelectric Cells. G. A. Boutry 1663
D.C. Amplifier. P. A. Macdonald and Jean T. Macpherson 2094
High Voltage-Sensitivity D.C. Amplifier. P. A. Macdonald and E. M. Campbell 4219
Evacuated Amplifying Device for the Measurement of Photoelectric Currents. J. F. H. Custers 4220
Resistance-Coupled Amplifier for Measuring Ionisation Currents. L. F. Curtiss 4221
Amplification of D.C. with a Tetrode. P. Donzelot and J. Divoux 4222
Current Measurement by means of the Kathode-Ray Oscillograph. A. Matthias, B. v. Borries and E. Ruska 5012
Improved D.C. Amplifying Circuit. L. A. DuBridge and H. Brown 5019
See also 2631, 3755, 4218 *under* 2.

4. Resistance Measurement (Apparatus and Methods).

Determination of the Relationship between Wave-Lengths of Light and the Fundamental Standards of Length. J. E. Sears, Jr., and H. Barrell.... 79

Conduction (Electric) in Solids and Liquids, ***continued.***

Abstract Nos.

Temperature Measurements. J. A. Hall and H. Barrell 79

Modifications of Resistance Thermometer Bridge and of Commutator Selector. Marion Eppley 655

B.A. Standards of Resistance, 1865–1932. R. T. Glazebrook and L. Hartshorn 731

Improved Conductivity Cell. B. Moore 1172

Condenser Resistance Measurement by Use of a Variable Mutual Inductance. W. Jackson 3756

Two Simple Methods of Absolute Measurement of Resistance in Terms of Inductance and Frequency. H. R. Nettleton and E. G. Balls.......... 3757

First Comparisons of National Electrical Resistance Standards by the International Bureau of Weights and Measures. A. Pérard and M. Romanowski 3777

See also 2631 *under* 2; 720, 722 *under* 6; 730, 3168, 3169 *under* 9 (*b*); 1274, 1610 *under* 9 (*c*).

5. A.C. Resistance, Skin Effect.

After-Effect Losses in Ferromagnetic Materials with Weak Alternating Fields. R. Goldschmidt 775

Theory of the Skin Effect. E. Rothe 4224

See also 4629 *under* 8.

6. Effects of Temperature, Pressure and Mechanical Stress of Resistivity.

Conductivity of NaCl Crystals Under Pressure. Z. Gyulai.................. 719

Resistivity of Polycrystalline Wires in Relation to Plastic Deformation and Mechanism of Plastic Flow. E. N. da C. Andrade and B. Chalmers 720

Variation of the Electrical Resistivity of Quartz with Temperature. S. Shimizu 721

Electrical Conductivity of Mercury at High Temperatures and Pressures. W. Braunbek 722

Temperature Coefficient of Resistivity of Silicon and a Thermoelectric Phenomenon of Unipolar Substances. C. Bedel 723

Resistance Anomaly in Pure Bismuth. C. Drucker 724

Change of Electrical Resistance with Magnetisation. W. Gerlach.......... 1203

Pressure Coefficient of Resistance at Liquid Oxygen Temperatures. P. W. Bridgman 1597

Effect of Tension on the Resistance of Single Bismuth Crystals. Mildred Allen 1598

Effect of Homogeneous Mechanical Stress on the Electrical Resistance of Crystals. P. W. Bridgman 1599

Restoration of the Electrical Resistance and Hardness of Copper, Silver, Gold, Platinum and Palladium from the Consequences of Mechanical Treatment when Cold. G. Tammann and K. L. Dreyer 1600

Electrical Conductivity of Mercury at High Temperatures. W. Braunbek.... 1601

Dependence of the Electrical Resistance of Pure Metals on Temperature. E. Grüneisen 2549

Recovery of the Electrical Resistance of Binary Mixed Crystals of Copper, Silver and Gold from the Consequences of Mechanical Treatment when Cold. G. Tammann and K. L. Dreyer 2550

Recovery from Mechanical Treatment when Cold in Iron and Nickel. G. Tammann and G. Moritz 2551

Recovery of Electrical Resistance of Hardness of Binary Iron Mixed Crystals from the Consequences of Mechanical Stress when Cold. G. Tammann and V. Caglioti 2552

Compressibilities and Pressure Coefficients of Resistance of Certain Elements, Compounds and Alloys. P. W. Bridgman.................. 2553

Effect of Pressure on Electrical Resistance of Single Metal Crystals at Low Temperatures. P. W. Bridgman 2554

Effect of Tension on the Electrical Resistance of Single Antimony Crystals. Mildred Allen 2555

Variation of the After-Effect of Quartz with Temperature. S. Shimizu 3160

Theory of the Relation between Pressure and Conductivity of Metals. W. Kroll 5020

See also 1595 *under* 1; 731 *under* 4; 4225 *under* 7; 728, 1167, 1168, 2062, 3761, 3765, 3766, 4213, 4214, 4215 *under* 9 (*a*); 3771 *under* 9 (*b*); 1610, 2008, 3172 *under* 9 (*c*).

For the Key to this Index see pp. 1358 to 1372.

Conduction (Electric) in Solids and Liquids, *continued.*

7. Surface Conduction. Contact Resistance (including Contact Rectifiers).

Abstract Nos.
Resistance and Points of Contact. L. Binder 342
A.C. Rectification by Photosensitive Crystalline Aggregates. G. P. Barnard 343
Copper-Oxide and Photronic Cells. C. H. Bartlett 404
Applications of Photronic Cells. G. A. Shook and Barbara J. Scrivener 405
Blocking-Layer Photoelectric Effects. F. Waibel 406
Crystal Structure of Electrodeposits from Copper Acetate Solutions. S. J. M. Allen, H. Kersten and J. Maas 428
Photoelectric Conductivity of Semi-Conductors. W. Leo 801
New Selenium Light Relay. L. Bergmann 803
Method of Measuring Photoelectric Currents in Semi-Conductors. B. Schönwald 1228
Photoelectric Cells. N. R. Campbell 1234
Measurements on Blocking-Layer Rectifier Photoelectric Cells. W. Meyer and A. Schmidt 1659
Dependence of Rectifier Photoelectric Cells upon Luminosity and Wave-Length. A. Goldmann and M. Lukasiewitsch 1660
Dependence of Rectifier Photoelectric Cells upon Luminosity and Wave-Length. A. Goldmann 1661
Gas-Adsorption in Electrically-Conducting Films during their Condensation from Molecular Rays. M. C. Johnson and T. V. Starkey 2666
Contacts of Two Different Conductors. R. Holm and R. Störmer 3161
Copper-Cuprous-Oxide Rectifier and Photoelectric Cell. L. O. Grondahl 3162
Photoelectric Effect in the "Active Layer" of Carborundum Crystals. O. W. Lossew 3255
Selenium Rectifier Photoelectric Cells. L. Bergmann 3262
New Detector. J. Cayrel 3758
Potential Discontinuities at the Contact of a Semi-Conductor and a Metal. G. Déchêne 3759
Theory of Electronic Semi-Conductors and their Possible Properties. R. H. Fowler 3760
Diffusion and Electrolytic Conduction in Crystals (Ionic Semiconductors). W. Jost 3762
Semi-Conductors: Dark Conduction and Photoelectric Conduction in Cuprous Oxide. E. Engelhard 4225
Equivalent Circuit of a Blocking-Layer Photo-Cell. L. A. Wood 4286
Contact Rectifier. M. Anastassiadés 5021
Preparation and Properties of Thin Lead Sulphide Layers with Special Consideration of their Detector Action. Part I. G. Brückmann 5410
Rectifier Effect in Solid Insulators. P. Böning 5411
See also 3761, 4213, 4214, 4215 *under* 9 (*a*).

8. Special Effects (Supraconductivity, etc.).

Change of Specific Heat of Tin when Becoming Supraconductive. W. H. Keesom and J. A. Kok 279
Theory of Supraconductivity. R. de L. Kronig 344, 1602
Supraconductivity of Gold-Bismuth. W. J. de Haas and T. Jurriaanse 345
Supraconductivity with H.F. Alternating Currents. J. C. McLennan, A. C. Burton, A. Pitt and J. O. Wilhelm 346
Supraconduction. M. v. Laue 725
Supraconductivity. W. Meissner 726
Electric Supraconduction in Metals. J. C. McLennan 727
Conduction of Heat in Lead-Thallium at Low Temperatures. W. J. de Haas and H. Bremmer 1118
Supraconductivity and the Hall Effect. I. Kikoin and B. Lasarew 3163
Theory of Supraconductivity. J. Dorfman 3164
Interpretation of Supraconductivity. L. Brillouin 3165
Mechanism of Supraconductivity. C. Benedicks 3763
Possible Explanation of Supraconductivity. J. Frenkel 3764
Supraconductivity and the Hall Effect. E. H. Hall 4226
Measurements with the Aid of Liquid Helium. Part XXII. Resistance of Metals, Alloys and Compounds. W. Meissner, H. Franz and H. Westerhoff 4626
Self-Consistent Field for Bound Electrons: Supraconductivity. L. Brillouin 4627
Theory of Supraconductivity. Part I. L. Landau 4628

Conduction (Electric) in Solids and Liquids, *continued.*

Abstract Nos.

Frequency Dependence of Supraconductivity and Ferromagnetism. R. Sänger 4629

Supraconductivity of Aluminium. W. H. Keesom 5022

Magnetic Interaction of Metallic Electrons. Criticism of Frenkel's Theory of Supraconductivity. H. Bethe and H. Fröhlich 5023

Supraconductivity. F. Zwicky 5412

Current Distribution in a Supraconducting Sphere. R. Becker, G. Heller and F. Sauter 5413

Magnetic Field in the Region of Supraconductivity. M. v. Laue and F. Möglich 5452

See also 717 *under* 1; 1597 *under* 6; 2482, 3765 *under* 9 (*a*).

9. Conductivity.

(*a*) *Metals, Alloys and Non-Metals.*

Physical Properties and Structure of the Binary System Iron-Cobalt. A. Kussmann, B. Scharnow and A. Schulze 28

Electrical Conduction of Oxygen Occluded by Palladium. D. P. Smith 347

Optical Transmission of Cu_2O in Relation to its Electrical Conductivity. G. Mönch 559

Conductivity of Corundum. H. v. Wartenberg and E. Prophet 728

Electrical Conductivity and Diagram of State of Binary Alloys. Lithium-Cadmium System. G. Grube, H. Vosskühler and H. Vogt 729

Metallic Films and Surfaces. K. Richter 843

Electrical Properties of Dilute Solid Solutions. Part III. Resistance of Copper and Gold Alloys. Regularities in the Resistance Increments. J. O. Linde 1167

Electrical Conductivity of Graphite Powder. Z. Specht 1168

Magnetic Properties of the Borides of the Rare Earths. W. Klemm, W. Schüth and M. v. Stackelberg 1204

Electrical Conductivity of Uranium Dioxide and its Use as a Series Resistance. W. Meyer 2006

Migration Constants of Solid Alkali Halides. W. Jost and H. Schweitzer 2007

Susceptibility and Electrical Conductivity of Copper-Manganese Alloys. S. Valentiner and G. Becker 2062

Physical Properties of Compounds of High Melting Point. K. Becker 2482

Conductivity of Oxides and Nitrides at High Temperatures. E. Podszus 2556

Change in the Lattice Constant and the Conductivity of Palladium by Charging with Electrolytic Hydrogen. F. Krüger and G. Gehm 2557

Lattice Constants and Electrical Conductivity of Electrolytically Charged Palladium-Silver Alloys and Their Dependence on the Dissolved Hydrogen. F. Krüger and G. Gehm 2558

Electrical Resistance of Hydrogen-Charged Palladium Wires. H. Brüning and A. Sieverts 2559

Diffusion in Crystals. G. v. Hevesy 2721

Electrical Conduction and Diffusion in Solid Silver Sulphide, Selenide and Telluride, and the Mechanism of their Formation from the Elements. C. Tubandt, H. Rheinhold and Anne L. Neumann 3166

Resistance Measurements of Palladium Wire Containing Hydrogen. C. A. Knorr and E. Schwartz 3167

Conductivity of α-Silver Sulphide. C. Wagner 3170

Conductivity of α-Silver Sulphide. Part II. W. Jost and H. Rüter 3171

Ludwig-Soret Effect and Ionic Mobility in CuBr-AgBr Mixed Crystals. H. Reinhold and R. Schulz 3192

Electronic Conductivity of the Copper Oxides. Part II. M. le Blanc, H. Sachse and H. Schöpel 3761

Electrical Properties of Thin Films of Platinum Obtained by Kathode Bombardment. A. Féry 3765

Electrical Resistance of Hydrogen-Charged Palladium Wires. H. Hagen and A. Sieverts 3766

Spectrum Analysis and Electrical Investigation of the Purest Platinum. W. Gerlach and Else Riedl 4126

Thermal and Electrical Conductivities of Several Metals. W. G. Kannuluik 4152

Electrical Conductivity of Zinc Oxide and Cadmium Oxide. H. H. v. Baumbach and C. Wagner 4213

Influence of Constitution of Cuprous Oxide on Electrical Properties. H. Dünwald and C. Wagner 4214

Conduction (Electric) in Solids and Liquids, *continued.*

Abstract Nos.

Conductivity of Copper Oxide. H. H. v. Baumbach, H. Dünwald and C. Wagner ... 4215

Electrical Conductivity in Zinc-Cadmium and Lead-Antimony Systems. M. le Blanc and H. Schöpel ... 4630

Electrical Conductivity of Cu$_3$Pd and Cu$_3$Pt Alloys. H. J. Seemann ... 4631

Thermo-E.M.F. and Ludwig-Soret Effect in Solid Salts and Mixed Crystals. H. Reinhold ... 4632

Electrical Conductivity and Diffusion in Non-Metallic Solids. C. Tubandt ... 4633

Transport of Material and Passage of Current in Liquid Alloys. K. Schwarz ... 4657

Hall Effect and other Physical Constants of Alloys. Part I. Lead-Bismuth Series of Alloys. W. R. Thomas and E. J. Evans ... 4666

Diffusion of Metals in Mercury. F. Weischedel ... 4752

Resistance of Palladium Wire Containing Hydrogen. D. P. Smith ... 5024

Conduction in Inorganic Materials Having Electron Conductivity. W. Meyer ... 5025

Conduction of Antimony Sulphide. G. S. Frey ... 5414

See also 720, 722, 1203, 1598, 1599, 2550, 2551, 2552, 2553, 2554 *under* 6; 4626 *under* 8.

(*b*) *Liquids* (*including Solutions*).

Conductivity of Aqueous Mixtures of Hydrogen Peroxide and Organic Acids. W. H. Hatcher and E. C. Powell ... 348

Electrical Conductivity of Alkali Metal Solutions in Liquid Ammonia. L. Farkas ... 349

Theory of Surface Conductivity. J. J. Bikerman ... 350

Equal Electrical Conductivities of Moving and Stationary Surfaces: Laing Paradox. E. Dubois ... 351

Influence of Time on the Conductivity of Colloids Measured at Different Levels. Papayanno ... 730

Irreversible Processes in Electrolytes: Diffusion Conductance and Viscous Flow in Arbitrary Mixtures of Strong Electrolytes. L. Onsager and R. M. Fuoss ... 741

Specific Conductivity of the Intermicellar Liquid of Gold Sols. R. Wintgen and W. Hacker ... 827

Filtration of (Hydrophobic) Colloids. May Annetts ... 828

Conductivity of Aluminium Chloride in Non-Aqueous Solutions. E. Wertyporoch and T. Firla ... 1603

Properties of Electrolytic Solutions. Part I. Conductance as Influenced by the Dielectric Constant of the Solvent Medium. Part II. Evaluations of Λ_0 and of K for Incompletely Dissociated Electrolytes. Part III. Dissociation Constant. Part IV. Conductance Minimum and Formation of Triple Ions Due to the Action of Coulomb Forces. R. M. Fuoss and C. A. Kraus ... 1604, 2010, 2593, 3775

Electrical Conductivity of Mixed Salt Solutions. A. K. Smith and R. A. Gortner ... 1605

Electrical Conductivities of Mixtures of Sulphuric Acid, Acetic Acid and Water. N. F. Hall and H. H. Voge ... 1606

Voltage Effect with Strong and Weak Bases. J. Schiele ... 1607

Method for Interpolating Data, Based on Dühring's Rule. J. H. Perry and E. R. Smith ... 1739

Conductivity of Nitric and Perchloric Acids and Mobility of the Hydrogen Ion. M. Hlasko and W. Klimowski ... 2009

Electrical Conductivity of Aqueous Solutions of Sodium and Potassium Hydroxides and the Limiting Mobility of the Hydroxyl Ion at 25° C. G. H. Jeffery and A. I. Vogel ... 2011

Conductivity Measurements in Nitro-Compounds. Part I. Measurements in Nitromethane. Part II. Measurements in Nitrobenzene. Part III. Behaviour of Electrolytes in Nitro-Compounds. P. Walden and E. J. Birr ... 2012, 2561

Anomalous Electrolytes. Part I. Electrical Conductivity of Solutions of Iodine and Cyanogen Iodide in Pyridine. L. F. Audrieth and E. J. Birr. Part II. Electrical Conductivity of Iodine and of Iodine Compounds in Ketones. E. J. Birr ... 2013, 4230

Effect of Small Water Additions upon the Conductivity of Electrolytes in Non-Aqueous Solvents. O. L. Hughes and H. Hartley ... 2560

Action of Ultra-Violet Radiation on Aqueous Solutions of Gelatin. P. Ponthus ... 2687

Conduction (Electric) in Solids and Liquids, *continued.*

Abstract Nos.

Solubilities, Conductivities, and Boiling-Point Elevations of Inorganic and Organic Compounds in Liquid Hydrogen Fluoride. K. Fredenhagen (with G. Cadenbach and W. Klatt) 3085
Transition Points of Salt Hydrates in Various Non-Aqueous Solvents. W. W. Lucasse and H. J. Abrahams 3106
Change in the Transformation Temperature of Copper Sulphate at 56° C. with the Solvent Medium. H. J. Abrahams and W. W. Lucasse 3107
System Water-Phenol. Part III. Electrical Conductivities. O. R. Howell and C. Handford 3168
Measurement of the Conductance of Electrolytes. Part V. Redetermination of the Conductance of Standard Potassium Chloride Solutions in Absolute Units. G. Jones and B. C. Bradshaw 3169
Differences between the Conductivity Coefficients of Strong Electrolytes in the Same Solvents. M. Hlasko 3767
Electrical Conductivity of Aqueous Solutions of the Alkali Metal Hydroxides. J. Goworecka and M. Hlasko 3768
Solubility of Lime in Water and the Specific Conductivities of its Saturated Solutions. A. D. Grive, G. W. Gurd and O. Maass 3769
Conductivity and Potential Measurements with Salts of the Higher Alkyl Sulphonic Acids. A. Lottermoser and F. Püschel 3770
Conductivity of Mixtures of Acetic Acid with Various Amines. N. A. Puschin and P. S. Tutundžic 3771
Conductivity Measurements in Aniline. P. Walden and L. F. Audrieth 3772
Conductivity Measurements in Acetophenone. P. Walden and E. J. Birr 3773
Conductivity Measurements in Cyclohexanone. P. Walden and E. J. Birr 3774
Theory of Electrolysis Phenomena in Metallic Solutions. K. Schwarz 3790
Electrolytic Fraction of the Conductivity of Amalgans and Other Alloys. Part II. C. Wagner 3791
Electrical Conductivity of Capillary and Colloidal Systems. J. J. Bikerman 3884
Limiting Conductivities of Salts in Non-Aqueous Solvents. C. W. Davies 4229
Properties of Electrolytic Solutions. Part V. Conductance of Amido Salts in Liquid Ammonia. C. A. Kraus and W. W. Hawes 4231
Conductivity of Hydrochloric Acid in Anhydrous Ether. T. Mounajed 4232
Electrical Conductivity of Some Fused Salt Mixtures. E. Ryschkewitsch 4233
Thermodynamic Ionisation Constants of Carbonic Acid. D. A. MacInnes and D. Belcher 4244
Conductivity of Electrolytic Solutions in Strong Fields and at High Frequencies. P. Debye 4635
Conductivity in Solvents Having Very Small Dielectric Constants. R. M. Fuoss 4636
A.C. Conductivity and Dielectric Constant of Electrolytes. P. Wenk 4637
Effect of Viscosity upon the Conductivity and Dielectric Constant of Electrolytes. O. Dobenecker 4638
Conductivites and Dieletric Constants of Liquids in H.F. Fields. M. Wien 4639
Electrical Conductivity of Monovalent Salts in Ethyl Alcohol. M. Barak and H. Hartley 4640
Conductivity Relationships of Non-Aqueous Solutions. H. Ulich 4641
Conductivity and Nature of Electrolytes in Metal Alkyls. F. Hein and H. Pauling 4642
Conductivity of Tetramethylammonium Salts in Methyl and Ethyl Alcohol. T. H. Mead, O. L. Hughes and H. Hartley 5026
Conductivity of Weak Electrolytes and Glycerin Solutions. B. G. Whitmore 5027
Dependence of Dispersion of Conductivity on Temperature. H. Geest 5028
Conductivity of Uni-Univalent Electrolytes at High Frequencies. E. Glowatzki 5029
Hall Effect and Resistance of Hydrogen-Charged Palladium-Silver and Palladium-Gold Alloys. J. Wortmann 5451
See also 722, 1601 *under* 6; 3167 *under* 9 (*a*); 4643 *under* 9 (*c*).

(*c*) *Dielectrics.*

Conductivity of Dielectrics after Exposure to X-Rays. M. Bender 352
Current Conduction in a Dielectric in which the Ions are Derived from an Electrode. W. O. Schumann 1169
Current Conduction in a Dielectric where Only One Ion is Free. W. O. Schumann 1170
Electrical Resistance of Wool Fibres. M. C. Marsh and Kathleen Earp 1274
Transverse Conductivity of Solid Dielectrics. W. Hubmann 1608

Conduction (Electric) in Solids and Liquids, *continued.*

Abstract Nos.

Current Conduction in a Dielectric. W. O. Schumann 1609
Electric Conductivity of Commercial Dielectrics and its Variation with Temperature. J. D. Clark and J. W. Williams 1610
Electrical Conductivity of Tridymite and Cristobalite at their Transformation Temperatures. S. Shimizu 2008
Mechanism of Current Conduction in Dielectric Liquids. A. Nikuradse 2014
Conduction of Electricity with High Fields in Dielectric Liquids. A. Nikuradse 2015
Conductivity of Polarisable Media. G. Jaffé 2016
Current and Field Characteristics in Insulating Material with a Single Thin Removable Surface Charge. W. O. Schumann 2562
Conducting Properties of Caoutchouc Strongly Charged with Lamp Black. J. Granier 3172
Current and Field Behaviour in Insulating Materials with Thin Mobile Charged Layers. W. O. Schumann 3182
Conductivity of Thin Films of Liquid Hydrocarbons. A. E. van Arkel and K. Koopman 3776
Properties of Gelatin in the Electric Field. Suzanne Veil 4316
Influence of Surface Charges on Conductivity of Poor Conductors. A. D. Goldhammer 4625
Electrical Conductivity of Solids in Strong Fields. A. v. Hippel 4634
Conduction in Dielectric Liquids at High Pressures. H. Edler and G. Zeier 4643
Electrical Properties of Calcite. S. Shimizu 5030
Effect of Temperature and Frequency on the Dielectric Constant, Power Factor, and Conductivity of Compounds of Purified Rubber and Sulphur. A. H. Scott, A. T. McPherson and H. L. Curtis 5036
See also 3756 *under* 4; 5411 *under* 7.

10. Unclassified.

Effect of High Electrostatic Fields upon the Vaporisation of Molybdenum. G. B. Estabrook 1939
Analogy between Mechanical and Electrical Systems. F. A. Firestone 2520
Sparks Produced by Short-Circuiting. W. Ende 4234

Conduction (Thermal).

1. Theory:
   (*a*) Mechanism of Conduction.
   (*b*) Propagation of Heat in Steady or Variable State.
2. Conductivity Coefficients:
   (*a*) Gases and Liquids.
   (*b*) Solids.
   (*c*) Experimental Methods.
3. Unclassified.

1. Theory.

(*a*) *Mechanism of Conduction.*
Heat Conduction and Convection from Tall Hot Vertical Cylinders and High Walls at Uniform Temperature. W. S. Kimball and W. J. King 284
Theory of Heat Conduction and Convection from Short Hot Vertical Cylinders. W. S. Kimball and L. D. Childs 1535
Heat Transfer for Fluids Flowing in Tubes. E. Hofmann 1932
General Properties of Steady Temperatures in Solids Partially Exposed to Gas. R. V. Churchill 1933
Theory of Thermal Conduction at Low Temperatures. W. Kroll 2471
Thermal Insulation. P. Vernotte 2472
Exchange of Energy between Polyatomic Molecules and a Metallic Surface. F. R. Whaley 2473
Heat Transmission to and from Tubes Set Perpendicular to a Stream of Air. J. T. M'Intyre 2474
Transmission of Heat from Honeycomb Radiators. J. Caldwell 2475
Energy Exchange at a Platinum-Hydrogen Interface. H. H. Rowley and K. F. Bonhoeffer 3075
Temperature Stresses in Walls and Flat Slabs. N. S. Boulton 3676
Detection of Adsorbed Gas Films on Heated Filaments. G. van Praagh 3870
Conduction of Heat. Part I. M. Jakob 4965
See also 4151 *under* 2 (*b*).

(*b*) *Propagation of Heat in Steady or Variable State.*
Temperature Distribution in Solid Bodies during Heating or Cooling. J. B. Austin 285
Surface Temperatures of Geometrically Simple Bodies. G. Pöschl 286

Conduction (Thermal), *continued.*

Abstract Nos.

Ultrasonic Waves. P. Biquard 312
Flow of Heat from a Rock Stratum in which Heat is being Generated. C. E. van Orstrand 957
Thermal Diffusivity of Zinc. R. H. Frazier 1536
Geometry of the Heat Equation. Part II. E. Kasner 1934
Qualitative Theorems on Heat Flows. G. Pólya 3076
Solution of Heat Conduction Problems by Method of Wave Trains. J. Robertson 3077
Periodic Heating and Cooling of a Semi-Infinite Solid Having Conductivity, Specific Heat and Density Varying (*a*) with Temperature, (*b*) with Depth. Y. Kodaira 3668
Geometry of Degenerate Heat Families. A. Fialkow 3669
Theory of Heat Conduction. B. Bružs 4149
Temperature Distribution of a Gas Flowing Through a Furnace. K. F. Herzfeld 4964

2. Conductivity Coefficients.

(*a*) *Gases and Liquids.*
Friction, Thermal Conductivity and Diffusion in Gaseous Mixtures. Parts XXI, XXII and XXIII. M. Trautz 643, 3079, 3080
Association in Gases under the Effect of Electric Fields. H. Senftleben 644
Thermal Conductivity of Air. H. S. Gregory and C. T. Archer 1935
Thermal Conductivity of Liquids. O. K. Bates 3078
Influence of Magnetic Fields on the Heat Conductivity of Gases. Part I. H. Senftleben and J. Pietzner 3670
Thermal Conductivity of Water. L. H. Martin and K. C. Lang 3671
Measurement of Thermal Conductivity in Gases. M. Trautz and A. Zündel. 4150
Thermal Conductivity of Colloid System. S. Bresler 4573
See also 4965 *under* 1 (*a*).
(*b*) *Solids.*
Investigation of the Cooling of Glowing Silit Rods by Photographic Pyrometry. R. Hase 287
Temperature Variation of the Thermal Conductivity of Pyrex Glass. R. W. B. Stephens 645
Conduction of Heat in Lead Thallium at Low Temperatures. W. J. de Haas and H. Bremmer 1118
Thermal Conductivities of Rocks. H. A. Nancarrow 3081
Tables for Calculation of Temperature-Distribution in a Cylinder. H. A. Nancarrow 3082
Total Radiation from Oxide Kathodes. P. Clausing and J. B. Ludwig 4069
Conduction of Heat in Powders. W. G. Kannuluik and L. H. Martin 4151
Thermal and Electrical Conductivities of Several Metals. W. G. Kannuluik .. 4152
Thermal Conductivity of Acheson Graphite. A. P. Crary 4574
Physical Properties of Glasses of the SiO_2-Na_2O-K_2O-CaO System. W. Hänlein 5367
See also 4965 *under* 1 (*a*).
(*c*) *Experimental Methods.*
Improvements in the Use of the Lees and Chorlton Heat Conductivity Apparatus. C. H. Lees and H. A. Nancarrow 646
Measurement of Thermal Conductivity of Poor and Medium Heat-Conducting Materials. R. W. B. Stephens 3083
See also 3078, 3671, 4150 *under* 2 (*a*); 3082 *under* 2 (*b*).

Convection.

1. Free Convection.
2. Forced Convection.
3. Emissivity and Rate of Cooling (including Loss of Heat by Radiation, Conduction and Convection).
4. Unclassified.

Cross-References:
Emissivity (Pure Radiation), *see* Radiation, Emission, 1.

1. Free Convection.

Natural Convection of Heat when the Heating is Very Small. Comparison of the Limiting Value of the Convection with the Thermal Conduction of the Medium. P. Vernotte 1119

Convection, ***continued.***

Abstract Nos.

Heat Transfer by Natural Convection. R. Hermann 1936
Transmission of Heat through Fabrics. M. C. Marsh 3084
See also 288 *under* 3.

2. Forced Convection.

Theory of Heat Conduction and Convection from Short Hot Vertical Cylinders. W. S. Kimball and L. D. Childs 1535
Heat Transfer for Fluids Flowing in Tubes. E. Hofmann 1932
Heat Transmission to and from Tubes Set Perpendicular to a Stream of Air. J. T. M'Intyre 2474
Transmission of Heat from Honeycomb Radiators. J. Caldwell 2475
Convection of Heat from Plates and Cylinders. N. A. V. Piercy and H. F. Winny 4575

3. Emissivity and Rate of Cooling (including Loss of Heat by Radiation, Conduction and Convection).

Heat Conduction and Convection from Tall Hot Vertical Cylinders and High Walls at Uniform Temperature. W. S. Kimball and W. J. King 284
Investigation of the Cooling of Glowing Silit Rods by Photographic Pyrometry. R. Hase 287
Determination of the Heat Loss from Local Heating Apparatus, Especially Radiators. E. F. M. van der Held and L. L. Mulder 288
Heat Loss from Dewar Flasks. K. S. and R. H. Cole 647
Radiation from Incandescent Oxides and Oxide Mixtures in the Visible Spectrum. H. Hoppe 1016
General Properties of Steady Temperatures in Solids Partially Exposed to Gas. R. V. Churchill 1933
Apparatus for Recording the Rate of Cooling of a Kata-Thermometer. C. P. Black 2490
Periodic Heating and Cooling of a Semi-Infinite Solid Having Conductivity, Specific Heat and Density Varying (*a*) with Temperature, (*b*) with Depth. Y. Kodaira 3668
Detection of Adsorbed Gas Films on Heated Filaments. G. van Praagh...... 3870
Output of Heat and Temperature Distribution of Electrically Heated Wires. A. Farkas and H. H. Rowley 4966
Cooling of a Radioactive Sphere. A. N. Lowan 5230

Cosmogony.

Cross-References:
Cosmic Radiation, *see* Radiation, Emission, 5.

Red Shift of Light from Spiral Nebulæ. H. E. Buc 105
Physical and Observational Evidence for the Expanding Universe. J. H. Reynolds 106
Expanding Universe. W. de Sitter 107
Expanding Universe. D. D. Kosambi and E. A. Milne 108
Transmutation of Elements in Stars. G. Steinsholt 127
Origin of the Solar System. H. Jeffreys 128
Structure and Internal Motion of a Gaseous Disc as Original State of the Planetary System. H. P. Berlage, Jr. 129
Space Distribution of Stars of Different Spectral Classes. F. Becker........ 513
Local Star System. F. Becker 517
Tidal Theory of Evolution of Solar System. L. N. G. Filon 916
World Structure and the Expansion of the Universe. E. A. Milne 1347
E. A. Milne's Theory of the Expansion of the Universe. E. Freundlich...... 1348
Origin of the Solar System. F. Nölke 1366
Equilibrium between Radiation and Matter in the Universe. A. Ganguli 1468
Relativity Cosmogony. R. Zaycoff 1759, 2816
Present Conception of the Structure of the Universe. E. Freundlich 1778
Observational Evidence for the Expansion of the Universe. H. Knox-Shaw .. 1784
Relativistic Cosmology. H. P. Robertson 2233
Contributions to the Cosmological Problem and the Problem of the Propagation of Light in Gravitational Fields. M. Kohler 2234
Expanding Universe. M. Bronstein 2235

Cosmogony, *continued.*

	Abstract Nos.
Spherical Condensations in the Expanding Universe. G. Lemaître	2817
Formation of Nebulæ in the Expansing Universe. G. Lemaître	2818
Mass-Particle in an Expanding Universe. G. C. McVittie	2819
Milne's Theory of the Expansion of the Universe. G. C. McVittie	2820
World Structure and the Expansion of the Universe. E. A. Milne	2821
Eddington's Problem of the Expansion of the Universe by Condensation. N. R. Sen	2822
Contraction of the Universe. E. Sevin	3370
Spectral Displacement of Extra-Galactic Nebulæ. F. Zwicky	3404
Milne's Theory of World Structure. W. O. Kermack and W. H. McCrea	3947
Universe without Curvature. T. Takéuchi	3948
Spontaneous Absorption of Radiation and the Red-Shift of Lines in the Spectrum of the Nebulæ. E. Sevin	3949
Age of the Universe and of the Earth. E. Belot	3966
Origin of the Solar System. W. J. Luyten	3967
Expanding Universe and the Time Scale. W. de Sitter	4377
Density of Energy in the Universe. S. A. Korff	4406
E. A. Milne's Theory of World-Structure. H. P. Robertson	4786
E. A. Milne's Theory of World Structure and the Expansion of the Universe. H. Dingle	4787
World Structure. E. A. Milne	4788
Spherical Mass-Particle in de Sitter's World. E. Reichenbächer	4789
World-Structure. E. A. Milne	5178
Statistical and Dynamical Aspects of the Fission Theory. W. Markowitz	5219

Crystal Structure and Properties.

1. General Theory.
2. Crystal Structure:
   - (*a*) Metals and Alloys.
   - (*b*) Inorganic.
   - (*c*) Organic.
   - (*d*) Biological.
3. Liquid Crystals.
4. Morphology of Crystals (Crystal Form, Habit, Growth).
5. Optical Properties.
6. Physical Properties (other than Optical).
7. Apparatus and Technique.
8. Unclassified.

Cross-References:

Diffraction and Reflection of Electrons by Crystals, *see* Electrons, Positrons and Protons, 3.
Photoelectric Effects, *see* Photoelectricity, 2.
Piezoelectric Effect, *see* Piezoelectricity.
Reflection of Atoms and Molecules by Crystals, *see* Kinetic Theory of Matter, 3.
X-Ray Diffraction, Reflection, etc., by Crystals, *see* X-Rays.

1. General Theory.

Statistical Mechanics with Particular References to the Vapour Pressures and Entropies of Crystals. R. H. Fowler and T. E. Sterne	99
Madelung Constants of Cubic Crystal Lattices. J. Sherman	427
Origin of Zero-Point Entropy. K. Clusius	669
New Representation of Geometrical Crystallography. B. Delaunay	841
Relation of Atomic Sizes to Interatomic Distances in Homopolar Crystals. G. W. Brindley	842
Structure of " Real " Crystals. E. Orowan	859
X-Ray Spectra and Lattice Binding. R. Glocker	1102
Laue Patterns from Thick Crystals at Rest and Oscillating Piezoelectrically. J. M. Cork	1283
Crystal Symmetry and Lattice Vibrations. A. D. Fokker	1284
Topologically Equivalent Crystal Bonds. H. Heesch	1681
X-Ray Structural Measurements and Explanations by Tetrahedral Atomic Domains. R. Reinicke	1682
Theory of Double Salts: Manganous Thorium Sulphate—New Type of Double Salt. R. M. Caven	2128
Structure of Crystals. U. Dehlinger	2129
Velocity of Nucleus Formation and Ostwald's Step Rule. I. N. Stranski and D. Totomanow	2130
Determination of Crystal Orientation. J. Thewlis	2131
Lattice Energies of the Silver and Thallium Halides. J. E. Mayer	2694
Wave Mechanical Significance of the Apparent Radii of Atoms and Ions. J. A. Wasastjerna	2799
Crystal Optics and Wave Mechanics. G. Wentzel	3296
Structure of Real Crystals. F. Zwicky	3297

For the **Key** to this Index see pp. 1358 to 1372.

Crystal Structure and Properties, *continued.*

Abstract Nos.
Magnetic Dipole Fields in Unstrained Cubic Crystals. L. W. McKeehan ... 3810
Magnetic Dipole Fields in Dislocated Cubic Crystals. L. W. McKeehan ... 3811
Magnetic Dipole Energy in Homogeneously Strained Cubic Crystals. L. W. McKeehan ... 3812
Magnetic Dipole Energy in Hexagonal Crystals. L. W. McKeehan ... 3813
Magnetic Quadripole Field and Energy in Cubic and Hexagonal Crystals. L. W. McKeehan ... 3814
Topology of Parallelepiped Lattices. H. Heesch ... 3892
" Correct Setting " of Crystals. G. Greenwood ... 3893
Determinations of the Signs of the Fourier Terms in Complete Crystal Structure Analysis. K. Banerjee ... 3894
Non-Crystallographic Point-Groups. W. Nowacki ... 4317
Stereochemistry of Crystalline Compounds. Part X. Molecular and Crystalline Configurations. P. Niggli and W. Nowacki ... 4318
Stereochemistry of Crystalline Compounds. Part XI. Formulæ of Crystalline Compounds, especially Silicates. P. Niggli ... 4319
Interatomic Distances in Crystals of the Alkali Halides. M. L. Huggins and J. E. Mayer ... 4320
General Formula for the Lattice-Energy of Crystals of Arbitrary Structure. A. Kapustinsky ... 4321
Crystal Lattice Energies and the Born-Haber Cycle. A. Kapustinsky and B. Weselowsky ... 4322
Lattice Energies of Cuprous Halides. J. E. Mayer and R. B. Levy ... 4323
Physics of Solids. B. E. Warren ... 4733
New Analysis of Slater's Compressibility Data for the Alkali Halides. H. M. Evjen ... 4734
Theory of Heteropolar Crystals. H. M. Evjen ... 4735
Mosaic Structure of Crystals. F. Blank ... 5121
Ratio λ_m/σ_m for Crystal and Liquids. R. Kaischew and L. Krastanow ... 5375

2. Crystal Structure.

(*a*) *Metals and Alloys.*
Separation of the α-Phase in β-Brass. M. Straumanis and J. Weerts ... 26
X-Ray Study of the Electrolytic Fe-Ni Alloys. K. Iwasé and N. Nasu ... 27
Physical Properties and Structure of the Binary System Iron-Cobalt. A. Kussmann, B. Scharnow and A. Schulze ... 28
Incidence of Lattice Distortion and Orientation in Cold-Rolled Metals. W. A. Wood ... 29
X-Ray Study of the Plastic Working of Magnesium Alloys. L. G. Morell and J. D. Hanawalt ... 55
Time of Relaxation of Heated Copper and Aluminium Wires in Torsional Vibration. D. Schenk ... 56
Supraconductivity of Gold-Bismuth. W. J. de Haas and T. Jurriaanse ... 345
Crystal Structure of Electrodeposits from Copper Acetate Solutions. S. J. M. Allen, H. Kersten and J. Maas ... 428
Lattice Constant for Cu-Pd Mixed Crystals. J. O. Linde ... 429
Metallic Films and Surfaces. K. Richter ... 843
Electron Interference and Röntgen Interference. F. Kirchner ... 1191
Properties of Homogeneously Distorted Cubic Ferromagnetic Lattices. F. Bitter ... 1217
Sodium-Lead Alloys. Structure of the Compound Known as Na_4Pb. C. W. Stillwell and W. K. Robinson ... 1285
Crystal Structure and Morphology of Gallium. F. Laves ... 1287
X-Ray Study of Ferrous Oxide Solid Solutions. E. R. Jette and F. Foote ... 1529
Precision Measurements of Crystal Parameters. E. A. Owen and E. L. Yates 1683
Lattice Structure of Indium. E. Zintl and S. Neumayr ... 1684
Crystal Structure of β-Lanthanum. E. Zintl and S. Neumayr ... 1685
Alloy Phases of the Type $NaPb_3$. E. Zintl and S. Neumayr ... 1686
X-Ray Investigations of, and Action of HNO_3 upon Au-Ag Alloys. M. le Blanc and W. Erler ... 1687
Crystal Structure of the Compound $LaAl_4$. A. Rossi ... 2132
Valency Electron Rule and Atomic Radii of Base Metals in Alloys. E. Zintl and G. Brauer ... 2133
Lattice Structure of NaIn and Deformation of Atoms in Alloys. E. Zintl and S. Neumayr ... 2134

For the Key to this Index see pp. 1358 to 1372.

Crystal Structure and Properties, *continued.*

Abstract Nos.

Crystal Structure of Precipitated Copper-Tin Alloys. H. Kersten and J. Maas 2135
Lattice Constants and Grain Size in Gold-Silver Alloys. P. Wiest 2136
X-Ray Study of Phase Boundaries in Thermal Diagrams of Alloy Systems—Cu-Zn System. E. A. Owen and L. Pickup 2137
X-Ray Study of Copper-Cadmium Alloys. E. A. Owen and L. Pickup 2138
Change in the Lattice Constant and the Conductivity of Palladium by Charging with Electrolytic Hydrogen. F. Krüger and G. Gehm 2557
Lattice Constant and Electrical Conductivity of Electrolytically Charged Palladium-Silver Alloys and their Dependence on the Dissolved Hydrogen. F. Krüger and G. Gehm 2558
Electrical Resistance of Hydrogen-Charged Palladium Wires. H. Brüning and A. Sieverts 2559
Elongation of Tin Crystals. J. Obinata and E. Schmid 2695
Crystalline State of Thin Sputtered Films of Platinum. G. P. Thomson, N. Stuart and C. A. Murison 2696
Crystal Structure and Lattice Constants of α-(β)-Tungsten. M. C. Neuburger 2697
Precision Measurement of the Lattice Constants of Beryllium. M. C. Neuburger 2698
Type of Binding and Lattice Structure of Binary Magnesium Compounds. E. Zintl and E. Housemann 2699
Crystal Structure of Uranium. T. A. Wilson 2700
X-Ray Analysis of Iron-Tin Alloys. W. F. Ehret and A. F. Westgren 2701
Mean Atomic Volume and Composition in Copper-Zinc Alloys. E. A. Owen and L. Pickup 2702
Mean Atomic Volume and Temperature in Copper-Zinc Alloys, with Observations on the β-Transformation. E. A. Owen and L. Pickup 2703
Mean Atomic Volume and Composition in Silver-Zinc Alloys. E. A. Owen and L. Pickup 2704
Magnetisation of Ferromagnetic Crystals. F. Bitter 3228
Magnetism and Disturbance of the Crystal Lattice. X-Ray Investigations of α-Iron. F. Regler 3230
X-Ray Examination of Electrolytic Chromium Deposits. G. R. Levi and M. Tabet 3298
Concentration of Valency Electrons in Binary Intermetallic Alloys. H. Perlitz 3299
Polymorphic and Magnetic Transformations. H. Lange 3823
Magnetic and Dilatometric Research on Hardening of Steel. W. Jellinghaus 3824
Structure of Magnesium, Zinc and Aluminium Films. G. I. Finch and A. G. Quarrell 3895
Catalytic Properties and Structure of Metal Films. Part I. Sputtered Platinum. G. I. Finch, C. A. Murison, N. Stuart and G. P. Thomson.... 3896
Heusler Alloys. S. Valentiner and G. Becker 4266
X-Ray Analysis of Zirconium Tungstide ZrW_2. A. Claassen and W. G. Burgers 4325
Thermal Expansion of Zinc by X-Ray Method. E. A. Owen and J. Iball.... 4577
X-Ray Investigation of the Copper-Aluminium Alloys. A. J. Bradley and (Miss) P. Jones 4736
X-Ray Analysis of the System Lithium-Cadmium. A. Baroni 4737
Mixed Crystal Formation in Single and Multi-Crystal Material. E. Schmid and G. Siebel 4738
Lattice Distortion in Nitrided Steels. W. A. Wood 4758
Allotropism of Beryllium. F. M. Jaeger and J. E. Zanstra 5122
Dependence of the Lattice Constant on the Hydrogen Concentration in the System Palladium-Hydrogen. G. Rosenhall 5123
Crystal Structure of the Compound Mg Pr. A. Rossi and A. Iandelli 5124
X-Ray Study of Binary Alloys of Silicon with Ag, Au, Pb, Sn, Zn, Cd, Sb and Bi. E. R. Jette and E. B. Gebert 5125
Law of Discontinuous Distribution of Curie Points. Part III. Applications. R. Forrer 5453
See also 1207, 1208, 1235, 1696 *under* 6; 3304, 4745, 4748, 4749, 4863 *under* 7.

(*b*) *Inorganic.*

Atomic Arrangement in Glass. W. H. Zachariasen 30
Structure of Potassium Osmiamate. F. M. Jaeger and J. E. Zanstra 31
Structure of Cæsium Osmiamate. F. M. Jaeger and J. E. Zanstra 32
Structure of Ammonium, Rubidium and Thallium Osmiamates. F. M. Jaeger and J. E. Zanstra 33

Crystal Structure and Properties, *continued.*

Abstract Nos.

Structure of Tetra- and Tri-Phosphonitrile Chlorides. F. M. Jaeger and J. Beintema ... 34
Crystal Structure of Green Salt of Magnus and Related Compounds. E. G. Cox, F. W. Pinkard, W. Wardlow and G. H. Preston ... 35
Modified Ionic States in Crystals. C. P. Snow and F. I. G. Rawlins ... 39
Crystal Structure of Calcium Metaborate, CaB_2O_4. W. H. Zachariasen and G. E. Ziegler ... 430
Space-Lattice of Cadmium Sulphate $CdSO_4 \cdot \frac{8}{3}H_2O$. L. Egartner, F. Halla and E. Schwarz ... 431
X-Ray Investigations of Ammonium Bifluoride, $NH_4\ HF_2$. O. Hassel and N. Luzanski ... 432
Structure of Potassium Dithionate, and Measurement of Integrated Reflection from a Small Crystal. G. V. Helwig ... 433
Inclusion of Small Amounts of Lead in Alkali Halides. H. Kāding ... 434
X-Ray Analysis of Iron Pyrites by Fourier Series. H. M. Parker and W. J. Whitehouse ... 435
Mechanism of Plasticity. N. J. Seljakow ... 453
Crystal Structure of Lead Bromide, $PbBr_2$. W. Nieuwenkamp and J. M. Bijovet ... 844
Crystal Structure of Lead Fluoride, PbF_2. J. A. A. Ketelaar ... 845
Structure of Potassium and Ammonium Perchlorates. C. Gottfried and C. Schusterius ... 846
X-Ray Investigations into the Change in Orientation of the Crystal Lattice Accompanying Modification of a Substance. H. Shôji ... 847
Crystal Structure of Lithium Sulphate. J. G. Albright ... 848
Carbonate and Nitrate Groups in Calcite and Aragonite Types of Lattice. R. Reinicke ... 849
Structure of α-Zinc Hydroxide. W. Feitknecht ... 850
Separation of Very Small Quantities of Substances on Crystallising Precipitates. R. Mumbrauer ... 1247
Typical Spinels. C. W. Parmelee, A. E. Badger and G. A. Ballam ... 1286
Crystal Structure of Sulvanite. L. Pauling and R. Hultgren ... 1288
Crystal Structure of Rubidium Nitrate. L. Pauling and J. Sherman ... 1289
X-Ray Investigation of 12-Molybdophosphates and Related Compounds. J. L. Hoard ... 1290
Crystal Structure of Potassium Silver Cyanide. J. L. Hoard ... 1291
Crystal Structure of Borides of the Composition XB_6. M. v. Stackelberg and F. Neumann ... 1292
Binding Energies in the Growth of Crystal Nuclei from Metallic Atoms. H. S. Taylor, H. Eyring and A. Sherman ... 1293
Crystal Structure of Sodium Ferrite. M. S. Goldsztaub ... 1294
X-Ray Study of the Changes in BaO-SrO Mixtures on Glowing. W. G. Burgers 1568
Atomic Radius of Carbon in Diamond. V. Posejpal ... 1671
Diaminozinc Bromide: Crystallographic Study. S. Kozik ... 1688
X-Ray Studies of Divalent and Trivalent Nickel Compounds. R. W. Cairns and E. Ott ... 1689
Crystal Structure of Potassium Bromoselenite. J. L. Hoard and B. N. Dickson 1690
Description and Structure of Lithium Hydroxide. T. Ernst ... 1691
Effect of Crystal Symmetry and Chemical Composition on the Energy Levels of Solids. F. H. Spedding and G. C. Nutting ... 1899
Fundamental Frequencies of the SiO_4 Group. J. Weiler ... 1912
Linear, Thermal Expansion of a Single Crystal of Sodium Nitrate. J. B. Austin and R. H. H. Pierce, Jr. ... 1937
Crystal Structure of Aluminium Halides. Part I. AlF_3. J. A. A. Ketelaar 2139
Lattice-Constant of the Rhombohedral Face of Quartz. V. Kunzl and J. Köppel ... 2140
Crystal Systems of Microcrystalline Ferric Oxides. A. Girard and G. Chaudron 2142
Crystal Structure of Silver Per-rhenate. F. Buschendorf ... 2143
Crystal Structure of Yttrium Vanadate. E. Broch ... 2144
Nickel Carbide and its Relations to Other Carbides of the Scandium-Nickel Element Series. B. Jacobson and A. Westgren ... 2145
Magnecrystallic Action. Part I. Diamagnetics. K. S. Krishnan, B. C. Guha and S. Banerjee ... 2616
Chemical and Crystallographic Investigations on Ammonium, Potassium, Rubidium, Caesium and Thallium Cobaltinitrites. A. Ferrari and C. Colla ... 2705

For the Key to this Index see pp. 1358 to 1372.

Crystal Structure and Properties, *continued.*

Abstract Nos.
Thermal Analysis of the Anhydrous Systems, $CoCl_2$-$PbCl_2$ and $FeCl_2$-$PbCl_2$. A. Ferrari and C. Colla 2706
Fibre-Structure and Optical Properties of Chalcedony. C. W. Correns and G. Nagelschmidt 2707
Structure of Potassium Thiocyanate. H. P. Klug 2708
X-Ray Study of Opals, Silica Glass and Silica Gel. I. Levin and E. Ott 2709
Structure of the Crystalline Platinocyanides. H. Brasseur 3300
Crystal Structure of Borides of Type MeB_6. F. Laves 3301
Atomic Radius of Carbon in Diamond. V. Posejpal 3292
Magne-Crystallic Action. Part II. Paramagnetics. K. S. Krishnan, N. C. Chakravorty and S. Banerjee 3825
Crystal Structure of Ammonium Hydrogen Fluoride, NH_4HF_2. L. Pauling.. 3897
X-Ray and Electron Diffraction of Iodine and the Diiodobenzenes. S. B. Hendricks, L. R. Maxwell, V. L. Mosley and M. E. Jefferson 3898
Theory of Water and Ionic Solution, with Particular Reference to H and OH[1] Ions. J. D. Bernal and R. H. Fowler 3951
Crystal Structure of Anhydrous Magnesium Iodide and Calcium Iodide. H. Blum 4326
Crystal Structure of the Nitrides and Phosphides of Bivalent Metals. M. v. Stackelberg and R. Paulus 4327
Crystal Structure of Zinc Hydroxide. R. B. Corey and R. W. G. Wyckoff.... 4328
Crystallography and Space-Group of Carbonate Tetra-amine, Cobalt-Sulphate $\left[\begin{matrix}Co_3\\ Co(NH_3)_4\end{matrix}\right]_2 SO_4 . 3H_2O$. L. W. Strock 4329
Crystal Lattice and Calculated Refractive Indices of Sodium Hydrogen Carbonate. W. H. Zachariasen 4330
Crystal-Orientation in Aggregates with Parallel Fibres. W. Jansen.......... 4739
Crystal Structure of Caesium, Thallium and Rubidium Per-rhenates. F. M. Jaeger and J. Beintema 4740
X-Ray Investigation of the System Nickel-Oxygen-Water. M. le Blanc and E. Möbius 4741
Raman Effect at Very Low Temperatures. G. B. B. M. Sutherland 4951
X-Ray Diffraction and the Structure of Glasses. J. T. Randall and H. P. Rooksby 5126
Position of the Hydrogen Ions in the NH_4Cl Crystal Determined by Electron Diffraction. W. E. Laschkarew and I. D. Usyskin 5439
See also 427, 1681, 3893, 4318, 4319, 4320, 4321, 4322, 4323 *under* 1; 1191, 1686, 2699 *under* 2 (*a*); 4722 *under* 3; 2150 *under* 4; 440, 2997, 3302 *under* 5; 1699, 3305 *under* 7.

(*c*) *Organic.*
Crystal Structure of *a*-Methylxyloside. E. G. Cox 36
Crystal Structure of Polymorphic Forms of Saturated Mono- and Di-Carboxylic Acids. F. D. la Tour 37
X-Ray Investigation of a Case of Chromoisomerism. E. Hertel and G. H. Römer 436
Alteration in Structure of Crystalline Salts of Long-Chain Fatty Acids at the Melting Point of the Parent Substances. P. A. Thiessen and Eva Ehrlich 437
X-Ray Investigation of Normal Paraffins Near Their Melting Points. A. Müller 821
Crystal Structure of *β*-Arabinose. E. G. Cox 851
p-Chlorobromobenzene and Its Congeners: Variate Equivalent Points in Molecular Lattices. S. B. Hendricks 852
Orientation of Organic Crystals in Contact with Ionic Minerals. L. Royer 1295
X-Ray Fibre-Diagrams of Cellulose. W. Schramek 2124
Crystal Structure of Methyl Urea. R. B. Corey and R. W. G. Wyckoff 2146
Polymorphism of Paraffins. N. Yannaquis 2147
Structure of Anthracene. J. M. Robertson 2710
Crystal Structure of *o*-Iodobenzoic Acid. H. P. King 2711
Structure of Cyanuric Triazide $(C_3N_3)(N_3)_3$. T. C. Sutton 2712
Macromolecular Lattice of Polyethylene Oxide. E. Sauter 2713
Model of the Principal Valency Chain in the Macromolecular Lattice of the Polyoxymethylenes. E. Sauter 2714
Crystal Structure of Triphenyl. E. Hertel and G. H. Römer 2715
Fine Structure of Trinitrobenzene Derivatives. E. Hertel and G. H. Römer.. 4331
Crystal Structure of a New Type of Molecular Compound. E. Hertel and G. H. Römer 4332

Crystal Structure and Properties, *continued.*

Abstract Nos.

Crystal Structure of Durene. J. M. Robertson 4333
Crystals of the Hydrated Chlorides, Bromides, Iodides of *d*- and *l*-Ephedrin and of *d*- and *l*-Pseudo-Ephedrin. B. Gossner and H. Neff 4334
Crystal Structure of *p*-Aminoazobenzene. M. Prasad and M. R. Kapadia 4742
Structure of Stilbene and Tolane. M. Prasad 4743
X-Ray Study of *p*-Diphenylbenzene. Lucy W. Pickett 4744
Fourier Analysis of the Durene Structure. J. M. Robertson 5127
Crystal Structure of Naphthalene. J. M. Robertson 5128
See also 3894 *under* 1; 1191 *under* 2 (*a*); 2145, 2616, 3825 *under* 2 (*b*); 853, 1692 *under* 4.

(*d*) *Biological.*

Crystals of the Living Body. W. H. Bragg 2148
See also 851 *under* 2 (*c*).

3. Liquid Crystals.

Liquid Crystal Character of Dipole Liquids at the Melting Point. L. S. Ornstein, W. Kast and P. J. Bouma 1296
Liquid Metal-Crystals. Part I. E. Donat and O. Stierstadt 4324
Liquid Crystals and Anisotropic Melts: "Theory of Liquid Crystals," by C. W. Oseen; "System of Mixed Dimensions," by D. Vörlander; "Supra-Crystallinity of *p*-Azoxybenzoic Acid," by D. Vorländer; "Liquo-Crystalline Resins and Lacquers," by D. Vorländer; "Cyclo-Pentanone and Cyclo-Hexanone," by D. Vorländer; "Polymorphism of Liquid Crystals: A Demonstration," by D. Vorländer; "Simple Arrangement to Demonstrate Liquid Crystals," by G. van Iterson, Jr.; "Forces Causing the Orientation of an Anisotropic Liquid," by V. Freedericksz and V. Zolina; "New Arguments for the Swarm Theory of Liquid Crystals," by L. S. Ornstein and W. Kast; "Effect of a Magnetic Field upon the Nematic State," by H. Zocher; "Magnetic Properties of Mesomorphic Substances: Analogies with Ferromagnetics," by G. Föex; "Inclinations of Molecules in some Crystalline-Fluid Substances," by K. Herrmann; "Rotating Molecules and the Liquid-Crystalline State," by T. Malkin; "Alterations in the Nature of a Fluid from a Gaseous to a Liquid-Crystalline Condition as shown by X-Rays," by G. W. Stewart; "Arrangements of Chain-Molecules in Liquid *n*-Paraffins," by A. Müller; "Anisotropic Melts: A Study in Change of State," by F. I. G. Rawlins; "Study of Crystalline Orientation by Electron Diffraction," by J. J. Trillat; "Anomalous Viscosity in Mesomorphic Melts," by Wo. Ostwald; "Viscosity of Liquid-Crystals," by R. O. Herzog and H. Kudar; "Lyotropic Mesomorphism," by A. S. C. Lawrence; "Paracrystallinity," by F. Rinne; "Crystalline Phases of Some Substances Studied as Liquid Crystals," by J. D. Bernal and D. Crowfoot; "Pseudo-Crystalline Structure of Water," by R. H. Fowler and J. D. Bernal 4335
Molecular Structure of Ice and Liquid Water. E. L. Kinsey and O. L. Sponsler 4722
Theory of Anisotropic Liquids. C. W. Oseen 5129
Range of Surface Forces. F. P. Bowden 5180

4. Morphology of Crystals (Crystal Form, Habit, Growth).

Crystal Axes of Single-Crystal Wires. B. Chalmers 38
Methods for Determination of Crystallo-Morphological Constants. G. Kalb .. 438
Crystalline Threads and Fibrous Forms of Aggregation. H. W. Kohlschütter .. 439
Habit and Structure of Potassium Bitartrate. A. Ferrari and R. Curti 853
Twinning of Quartz. O. Mügge 854
Rhythmic Crystallisation of Alkali Carbonates in the Presence of Gelatin. Suzanne Veil 1298
Optical Isomerides and Rates of Crystallisation. Non-existence of Racemates in the Liquid State. G. Rumeau 1692
Difference between Mica and Clay as regards Possible Orientation of Crystals on Them. L. Royer 1693
Phlorizin Crystals. P. Gaubert 1694
Influence of X-Ray upon the Formation of Crystal Nuclei. D. Samuiacas 1695
Electrical Conductivity of Tridymite and Cristobalite at their Transformation Temperatures. S. Shimizu 2008
Effect of Foreign Matter in Solid Solution on the Stability of Crystals. P. Gaubert 2149

Crystal Structure and Properties, ***continued.***

Abstract Nos.

Artificial Preparation of Regular Crystal Growths of Potash Alum. Marianna Schaskolsky and A. Schubnikow 2150
Systematic Habit-Variation in Potassium Chlorate Crystals Produced by Dyes. H. E. Buckley and W. Cocker 2151
Orientation of Crystals on Hydrargillite and on Twinned Calcite. L. Royer 2152
Alkylamine-Alums, and Other Alums with Organic Radicals. K. Wendekamm 2153
Connection between Distortion and Recrystallisation Capacity in Plastic Deformation of Metals. W. G. Burgers and J. J. A. P. van Amstel 2178
Crystalline Form of Dinitro-Cobaltammines. W. M. McNabb and H. A. Alsentzer, Jr. 2716
Dependence of Crystallisation Velocity on Moleculer Structure. M. E. Krahl 2717
Motion of Liquid Drops on Growing Crystals. L. Kowarski 2718
Plasticity and Mechanical Twinning in Quartz. K. Zinserling and A. Schubnikow 3910
Adsorption, Orientated Overgrowth and Mixed Crystal Formation. C. W. Bunn 4336
Perfection of Crystal Laminæ. W. N. Bond 4337
Method of Producing Single Crystals. A. I. Froiman and P. A. Polibin 4338
Direction of Growth of Acicular Crystals of Glucose Penta-acetate and Cellobiose Octa-acetate. K. Hutino 4746
Interferometric Examination of Cleavage Faces of Crystals. M. Siegbahn 5130
Theory of Distribution of Electrolytes Between a Solid Crystalline and a Liquid Phase. A. P. Ratner 5376
See also 2130 *under* 1; 1287, 4738 *under* 2 (*a*); 2706, 4739 *under* 2 (*b*); 4324, 5180 *under* 3; 2342, 2343, 5261 *under* 5; 1710 *under* 6.

5. Optical Properties.

Raman Effect in Molecules and Crystals. E. Fermi 258
Optical Properties of Carbonates. H. Brasseur 440
Change of Reflectivity of Bismuth due to Magnetisation. E. Englert and K. Schuster 584
Triboluminescence. S. S. Bhatnagar, K. G. Mathur and K. L. Budhiraja 1000
Reflection and Refraction by Transparent Materials. W. Hartwig and A. Johnsen 1023
Nature of the Absorption Centres in Crystals and Solutions Containing Paramagnetic Ions. Mechanism of the Absorption. D. M. Bose and S. Datta 1430
Preparation of Residual-Ray Plates and the Reflection Power of Powders. R. B. Barnes 1472
Light Rays and Wave Surfaces in General Anisotropic Bodies. P. Frank 1475
Pauly Method of Determining Refractive Indices of Liquids. F. C. Phillips and W. A. Wooster 1476
Pleochroism of Calcite in the Infra-red. P. le Roux 1845
Paramagnetic Properties of Crystals of the Rare Earths. H. A. Kramers 1849
Zeeman Effect in Solids. F. H. Spedding 1906
Natural Blue Rock-Salt. K. Przibram 2342
Recrystallisation and Coloration. Parts III and IV. K. Przibram 2343, 5261
Testing the Polarisation of the K-Radiation of the X-Ray Fluorescence of Anisotropic Single Crystals. M. Groos 2356
Luminescence and Crystal Structure. B. E. Cohn 2359
Refractive Indices of Ammonium Nitrate. S. B. Hendricks, W. E. Deming and M. E. Jefferson 2393
Position of the Absorption Spectra of Photochemically-Coloured Alkali Halogen Crystals. H. Fröhlich 2434
Reflective Power and Bireflection of Nickel Arsenide. W. Faber 2997
Molecular Refraction of Alums. K. Wendekamm 3001
Raman Spectra of Alkali Metal Nitrates. H. Nisi 3041
Depolarisation of Light Scattered by a Uniaxial Crystal when the Optic Axis and the Scattered Ray are Parallel. J. Cabannes 3044
Influence of Temperature on the Röntgenisation of Rock-Salt. C. Sinelnikow, A. Walther, I. Kurtschatow and S. Litwinenko 3059
Composition and Structure of Artificial Spherulites. H. W. Morse, J. D. H. Donnay and E. Ott 3302
Source of Error in Determination of Symmetry from Optical Extinction-Angles. M. H. Hey 3303
Dependence of the Intensity of the Raman Scattered Radiation of Quartz on the Exciting Frequency. L. S. Ornstein, J. J. Went and A. H. W. Aten, Jr. 3606
Crystallography of Compounds of Gadolinium and Samarium. A. Pabst 3899

Crystal Structure and Properties, *continued.*

Abstract Nos.
Ray-Surface and Optical Indicatrix. G. Tunell 4082
Optical Anisotropy of Molecular Crystals. Part I. Experimental. S. B. Hendricks and M. E. Jefferson 4487
Complex Indicatrix of Weakly Absorbing Rhombic Crystals. M. Berek and F. Strieder 4747
Colouring and Decolouring of Compressed Rock-Salt. Magdalene Haberfeld .. 4864
Colour Centres in Alkali Halide Crystals. E. Mollwo 4865
Optical Properties of the Double Salt $(NH_4)_2 SO_4$, $CaSO_4$, $2H_2O$. A. R. Merz, J. O. Hardesty and S. B. Hendricks 4909
Additive Colour Effects of Alkali Halide Crystals. Part III. E. Rexer 5131
Paramagnetic Properties of Crystals of the Rare Earths. Part II. H. A. Kramers 5461
See also 3296 *under* 1; 843 *under* 2 (*a*); 39, 1688, 1691, 2143, 2707, 3300, 4326, 4330 *under* 2 (*b*); 2147 *under* 2 (*c*); 1694, 2149 *under* 4; 5066 *under* 6.

6. Physical Properties (other than Optical).

Influence of Foreign Substances on the Cohesion Limits and Ultramicroscopic Sol-Formation of Synthetic Rock-Salt Crystals. Part III. Heavy Metal Chlorides. W. Metag. Part IV. Density Determination. J. Köhler .. 40
Plastic Extension of α-Iron Crystals. W. Fahrenhorst and E. Schmid 54
Reticular Distortion and Internal Stresses of Metals. V. Montoro 64
Magnetic Effects in Iron Crystals. A. G. Hill 386
Spontaneous Magnetisation and Thermo-Remanence in Ferromagnetic Single Crystals. J. Koenigsberger 387
Variation of Principal Magnetic Susceptibilities of Certain Paramagnetic Crystals with Temperature. B. W. Bartlett 389
Magnetostriction and Magnetisation of Single Crystals of the Iron-Nickel Series. F. Lichtenberger 395
Dissociation-Heat of the Lead Lattice. G. v. Hevesy, W. Seith and A. Keil .. 441
Isothermal and Adiabatic Moduli of Elasticity of Crystallised Quartz. R. de Mandrot 452
Vacuum Apparatus for Measuring Thermal Expansion at Elevated Temperatures, with Measurements on Pt, Au, Mg, and Zn. J. B. Austin 649
Conductivity of NaCl Crystals under Pressure. Z. Gyulai 719
Resistivity of Polycrystalline Wires in Relation to Plastic Deformation and Mechanism of Plastic Flow. E. N. da C. Andrade and B. Chalmers 720
Variation of the Electrical Resistivity of Quartz with Temperature. S. Shimizu 721
Temperature Coefficient of Resistivity of Silicon and a Thermoelectric Phenomenon of Unipolar Substances. C. Bedel 723
Supraconduction. M. v. Laue 725
Magneto-Mechanical Effect. N. Akulov and E. Kondorsky 779
Torsional and Flexual Oscillations of a Monocrystalline Rod. E. Goens 862
Non-Uniform Expansion of Zinc Crystals. R. Becker and E. Orowan 1120
Current Conduction in a Dielectric where Only One Ion is Free. W. O. Schumann 1170
Resistance Variation in Ferromagnetic Crystals. R. Gans and J. v. Harlem 1202
Ferromagnetic Crystals. R. Gans 1205
Quantitative Method for Investigating the Texture of Rolled Metal. N. Akulov and N. Brüchatov 1207
Complicated Magnetic Structure of Single Ferromagnetic Crystals. N. Akulov and M. Degtiar 1208
Mono-Crystal Barkhausen Effects in Rotating Fields. F. J. Beck, Jr., and L. W. McKeehan 1209
Magnetic Susceptibilities of Some Paramagnetic Substances. W. Sucksmith 1212
Influence of Crystalline Fields on the Susceptibilities of Salts of Paramagnetic Ions. Part II. Iron Group. Especially Ni, Cr and Co. R. Schlapp and W. G. Penney 1213
Internal Photoelectric Effect in Crystals. A. H. Wilson 1235
Electrical Resistance of Wool Fibres. M. C. Marsh and Kathleen Earp 1274
Elasticity of Wet Salt Crystals. K. H. Dommerich 1310
Low-Temperature Tensile Strength of Rock-Salt. W. Burgsmüller 1315
Triple Interferometer for Distinguishing Flexural and Longitudinal Vibrations in Quartz. H. Osterberg 1436

Crystal Structure and Properties, *continued.*

Abstract Nos.
Low Temperature Specific Heats. Part III. Molecular Rotation in Crystalline Primary Normal Amyl Ammonium Chloride. J. C. Southard, R. T. Milner and S. B. Hendricks 1532
Effect of Tension on the Resistance of Single Bismuth Crystals. Mildred Allen 1598
Effect of Homogeneous Mechanical Stress on the Electrical Resistance of Crystals. P. W. Bridgman 1599
Theory of the Ferromagnetic Anisotropy of Single Crystals. R. M. Bozorth 1641
Theory of the Crystal-Photoelectric Effect. H. Teichmann.......... 1662
Resistance Limits in Mixed Crystals with a Statistical Atomic Distribution. Parts I and II. Part I, R. Glocker; Part II, R. Glocker and U. Dehlinger.......... 1696
Recrystallisation and Hardening of Aluminium due to Plastic Torsion. A. E. van Arkel and M. G. van Bruggen.......... 1710
Theory of Galvanomagnetic and Galvanoelastic Effects. N. Akulov.......... 2055
Electrical Phenomena in Lead Glance Crystals Caused by Light, Heat and Kathode Rays. E. Rupp 2081
Experiments on Cohesion. Part IV. Cleavage in Galena. H. Tertsch.......... 2154
Annealing of Plastically-Deformed Rock-Salt Crystals. N. A. Brilliantow and I. W. Obreimow 2155
Rigidity of the Multiple Crystal. W. Kuntze.......... 2170
Plasticity and Hardness of Crystals of Alkali Metal Halides. K. Przibram 2171, 5141
Recovery of the Electrical Resistance of Binary Mixed Crystals of Copper, Silver and Gold from the Consequences of Mechanical Treatment when Cold. G. Tammann and K. L. Dreyer 2550
Recovery from Mechanical Treatment when Cold in Iron and Nickel. G. Tammann and G. Moritz 2551
Recovery of Electrical Resistance and of Hardness of Binary Iron Mixed Crystals from the Consequences of Mechanical Stress when Cold. G. Tammann and V. Caglioti 2552
Compressibilities and Pressure Coefficients of Resistance of Certain Elements, Compounds and Alloys. P. W. Bridgman.......... 2553
Effect of Pressure on Electrical Resistance of Single Metal Crystals at Low Temperatures. P .W. Bridgman 2554
Effect of Tension on the Electrical Resistance of Single Antimony Crystals. Mildred Allen 2555
Dielectric Losses in Rock-Salt. P. L. Bayley.......... 2575
Change of Resistance of Bi Single Crystals in Magnetic Fields (New Phenomena). O. Stierstadt 2608
Crystalline Fields of Pr, Nd and Yb from Paramagnetic Susceptibilities. W. G. Penney 2620
Magnetostriction of Ferromagnetic Crystals. R. Gans and J. v. Harlem.... 2630
Velocity of Diffusion of Metals in Gold and Silver. W. Jost.......... 2723
Elastic Properties of Gold-Silver Single Crystals. H. Röhl.......... 2739
Tensile Strength of Mica. E. Orowan.......... 2740
Variation of the After-Effect of Quartz with Temperature. S. Shimizu...... 3160
Ionic Polarisation in Crystals. J. Errera and H. Brasseur 3177
Investigation of the Dielectric Properties of Rochelle Salt by Means of X-Rays. H. Staub 3178
Lower Curie Point of Rochelle Salt. B. and I. Kurtschatow.......... 3183
Electric Properties of Isomorphous Crystals. M. Eremejew and B. Kurtschatow 3267
Brittleness, Plasticity and the Gliding Elements of α-Iron. F. Sauerwald and H. G. Sossinka 3314
Elastic Constants of Rochelle Salt by a Dynamical Method. R. M. Davies.... 3316
Plasticity in Single Crystals. H. Schlechtweg.......... 3317
Thermal Expansion and Lattice Theory. A. Papapetru 3674
Diffusion and Electrolytic Conduction in Crystals (Ionic Semiconductors). W. Jost 3762
Magnetic Structure of an Iron Alum in Strong (Magnetic) Fields. J. Forrest 3826
Principal Magnetic Susceptibilities of Some Paramagnetic Crystals at Low Temperatures. L. C. Jackson 3827
Magnetostriction. A. Schulze.......... 3842
Temperature Dependence of Young's Modulus for Nickel. J. Zacharias.... 3905
Tensile Strength of Rock-Salt. K. Honda and R. Kimura.......... 3906
Tensile Strength of Crystals. A. Smekal 3907
Influence of Impurity on the Tensile Strength of Rock-Salt. W. Burgsmüller 3908

Crystal Structure and Properties, *continued*.

Abstract Nos.
Tensile Strength of Rock-Salt at 1·2° Abs. K. Steiner and W. Burgsmüller 3909
Relation between Electrolytic Conductivity and Self-Diffusion and Crystallographic Direction. W. Seith 4227
Electrical Conductivity in Zeolites. E. Rabinowitsch and W. C. Wood 4228
Absolute Saturation of Cubic Cobalt. R. I. Allen and F. W. Constant 4269
Mechanical Properties of Wetted Rock-Salt Crystals. N. Dawidenkow and M. Classen 4339
Plasticity in Single Crystals. W. G. Burgers, Schlechtweg 4348
Cohesion and Plasticity in Crystals. A. Smekal 4349
Thermo-E.M.F. and Ludwig-Soret Effect in Solid Salts and Mixed Crystals. H. Reinhold 4632
Unipolarity of the Polarisation in Rochelle-Salt Crystals. I. Kurtschatow 4644
Anomalous Dispersion of the Dielectric Constant of Rochelle Salt. G. Busch 4645
Specific Inductive Power and Water of Crystallisation of Alums. J. Errera and H. Brasseur 4646
Contact Potential Differences between Different Faces of Copper Single Crystals. H. E. Farnsworth and B. A. Rose 4665
Remanence of Single Iron Crystals. S. Kaya 4671
Elastic Constants of Single Crystals of Copper. R. Kimura 4756
Thermal Expansion of Crystals with Layer Lattices. Helen D. Megaw 4968
Thermal Expansion of Quartz by X-Ray Measurements. A. H. Jay 4969
Electrical Properties of Calcite. S. Shimizu 5030
Crystal Structure and Electrical Properties. Part II. Lattice Structure and Conductivity of Single Crystals of Bismuth in a Transverse Magnetic Field. O. Stierstadt 5066
Magnetic Dipole Fields in Unsaturated Cubic Crystals. L. W. McKeehan 5069
Geometrical Lattice Limitation of the Sliding Surfaces in Crystals. H. G. Sossinka, B. Schmidt and F. Sauerwald 5132
Elastic Properties of Alloys and of Mixed Crystal Series. H. Röhl 5139
Supraconductivity. F. Zwicky 5412
Conduction of Antimony Sulphide. G. S. Frey 5414
Electrical Conductivity of Single Crystals. W. Lehfeldt 5415
Inner Potentials of Semi-Conductors. K. R. Dixit 5445
Mechanostriction and ΔE Effect. N. Akulov and E. Kondorsky 5465
See also 99, 669, 4733, 4734, 4735 *under* 1; 28, 29, 55, 843, 1217, 1683, 1684, 1687, 2557, 2558, 2559, 2695, 2699, 3228, 4266, 4325, 4577 *under* 2 (*a*); 31, 847, 1286, 1290, 1937, 2140, 2143, 2616, 2705, 3825, 5439 *under* 2 (*b*); 437, 1295, 4331 *under* 2 (*c*); 4324 *under* 3; 438, 1694, 2008, 2149, 2151, 2153, 2178, 3910 *under* 4; 1430, 1849, 2343, 3302, 5461 *under* 5; 2054, 2743 *under* 7.

7. Apparatus and Technique.

X-Ray Diffraction Method for Crystalline Aggregates. H. Seeman 41
Metallography with Polarised Light. L. Tronstad 208
X-Ray Apparatus for Investigation of Microscopic Crystals. O. Kratky and K. Eckling 442
Quantitative Crystalline Analysis by X-Rays. M. E. Nahmias 443
Corrections for Debye-Scherrer X-Ray Photographs. Z. Nishiyama 444
Preparing Crystals for Rotation Photographs. H. Kersten and W. Lange 855
Particle Size Determination by Electron Diffraction. M. v. Laue 856
Precision Determination of Lattice Constants of Non-Cubic Substances. W. Stenzel and J. Weerts 857
Structure of Interference Lines in the Powder Method. I. Levin and E. Ott 858
Self-Rectifying Demountable X-Ray Tube of High Power. C. E. Eddy 1113
Graphical Method of Interpreting Weissenberg Photographs. W. A. and Nora Wooster 1299
Two Rulers for Use in Analysing Rotating Crystal Photographs. M. L. Huggins 1300
Preparation of Collodion Filters for X-Rays. H. Kersten and J. Maas 1301
Evaluation of Fibre Diagrams. E. Sauter 1697
Rotation X-Ray Goniometer Diagram. E. Sauter 1698
Direct Determination of Indices and Location of Spots in a Laue Pattern of Calcite. G. F. H. Harker 1699
Emission and Absorption Spectra with Bent Crystals as Transmission Gratings. A. Sandström and E. Carlsson 1929

For the Key to this Index see pp. 1358 to 1372.

Crystal Structure and Properties, *continued.*

Abstract Nos.

Resistance Variation of Bismuth Crystals in a Magnetic Field. Part I. Electrical Method of Crystal Structure Analysis. O. Stierstadt.......... 2054
Simple Universal Camera for X-Ray Analysis. E. Sauter 2156
Effect of Etching on the Relative Intensities of the Components of Double Laue Spots Obtained from a Quartz Crystal. M. Y. Colby and G. Harris 2157
Accurate Method of Determining Lattice Constants. V. Kunzl and J. Köppel 2158
Spectrography of X-Rays Using a Divergent Beam. Y. Cauchois............ 2462
X-Ray Fibre-Diagrams of Cellulose. K. Hess and C. Trogus 2691
Quantitative Crystal Analysis by X-Rays. M. E. Nahmias 2719
Preparation of Single Crystals having a Given Axis Orientation. P. A. Palibin and A. I. Froiman 2720
Improved Apparatus for Static Measurements of Torsional Modulus of Crystal Rods and Application to Single Crystals of Zinc. E. Goens............ 2743
Optical Determination of Orientation of a Single Crystal. E. Jakowlewa.... 3304
Quartz as a Standard for Accurate Lattice-Spacing Measurements. A. J. Bradley and A. H. Jay 3305
X-Ray Measurement of Strain. H. Möller 3657
X-Ray Detection of Lattice Distortion. B. Pfarr 3658
X-Ray Photography of Powders at Liquid-Air Temperature. J. A. Santos and J. West 3661
Four-Place Table of $\sin x/x$. J. Sherman 3927
Integrating Photometer for X-Ray Crystal Analysis. B. W. Robinson 4148
High-Temperature X-Ray Camera for Precision Measurements. A. H. Jay .. 4340
Recording Photodensitometer for X-Ray Photographs. W. O. Milligan 4562
Bending of Crystals and Focussing Effect in X-Ray Spectroscopy. E. Carlsson 4565
Crystal Axes of Single-Crystal Wires. R. Roscoe and P. J. Hutchings........ 4745
Crystal Parameters of Metals under Reduced Pressure. E. A. Owen and E. L. Yates 4748
Long-Wave X-Rays for Crystal Analysis. G. Hägg.......... 4749
Crystal Structure Model. G. Glockler 4750
Application of ThB, the Radioactive Isotope of Pb, in Metallurgy. G. Tammann and G. Bandel 4863
Inherent Limitation of Soller (Multiple) Slits. T. N. White 5133
See also 2131, 3893 *under* 1 ; 1683, 2138, 3895, 3896 *under* 2 (*a*) ; 433, 435, 2140, 4326 *under* 2 (*b*) ; 2124, 2710 *under* 2 (*c*) ; 38, 2718, 4338 *under* 4 ; 4747 *under* 5 ; 1310, 1436, 3827, 5445 *under* 6.

8. Unclassified.

Cooperative Phenomena. F. Zwicky 1700
Diffusion in Crystals. G. v. Hevesy 2721
Polish on Metals. R. C. French 3526

Density.

1. Density of Gases and Vapours.
2. Density of Liquids.
3. Density of Solids.
4. Apparatus and Technique.
5. Unclassified.

Cross-References :
Earth, *see* Land, Physics of the.

1. Density of Gases and Vapours.

Density Curves and Rectilinear Diameter of Carbon Monoxide. E. Mathias, C. A. Crommelin, W. J. Bijleveld and P. P. Grigg.......... 42
Densities of Saturated Vapours. R. Wright.......... 671
Variation of Dielectric Constant with Temperature. Part II. Electric Moments of Ethylene Halides. E. W. Greene and J. W. Williams...... 736
Density and Molecular State of Gaseous Rhenium Tetrachloride and Rhenium Hexachloride. D. M. Yost and G. O. Shull 822
Improved Gas Density Balance with Electromagnetic Measuring Device. E. Lehrer and E. Kuss 1302
Variations in the Density and the Oxygen Content of Atmospheric Air. A. Stock, H. Ramser and G. Eyber.......... 1303
Normal Density of Ammonia. G. Dietrichson, L. J. Bircher and J. J. O'Brien 1304
Density of Ammonia at Reduced Pressures and its Relation to the Atomic Weight of Nitrogen, the Gas Constant R, and the Limiting Molal Volume V_0. G. Dietrichson, C. W. Orleman and C. Rubin.......... 1305
Isotherms of Helium at Low Temperature and High Pressure. E. Buchmann 2168

Density, *continued.*

Abstract Nos.

Physical Properties of Di-Vinyl Ether. F. T. Miles and A. W. C. Menzies.... 3116
Density of a Vapour in Equilibrium with a Liquid near the Critical Temperature. J. S. Tapp, E. W. R. Steacie and O. Maass.................... 4751
Formula for Specific Volumes of Saturated Vapours. C. H. Meyers........ 5372

2. Density of Liquids.

Alkali Metals and Salt Densities in Liquid Ammonia. W. C. Johnson and A. W. Meyer.................... 43
Total and Specific Heats of a Series of Fractions of Petroleum, and their Relation to Other Properties. Parts IX-XII. H. R. Lang and R. Jessel.... 275
Supposed Allotropy of Liquid Nitrobenzene. E. Cohen and L. C. J. te Boekhorst.................... 423
Liquid Nitrobenzol near the Melting Point. J. Wellm.................... 650
Parachor of Rhenium. H. V. A. Briscoe, P. L. Robinson and A. J. Rudge.... 901
Rapidly Oscillating Pendulums in Liquids. A. Krebs and H. Landsberg.... 1336
Some Physical-Chemical Constants of Dioxan. W. A. Roth and Ingrid Meyer 1541
Conductivity Measurements in Nitro Compounds. Part I. Measurements in Nitromethane. Part II. Measurements in Nitrobenzene. P. Walden and E. J. Birr.................... 2012
Allotropy of Liquid Nitrobenzene. E. L. Lind and T. F. Young.............. 2243
Molecular Refraction in Dilute Solutions. Part I. Differential Buoyancy Method for Accurate Density Measurements. W. Geffcken, C. Beckmann and A. Kruis.................... 2398
Effect of Small Water Additions upon the Conductivity of Electrolytes in Non-Aqueous Solvents. O. L. Hughes and H. Hartley................ 2560
Azeotrodic Hydrobromic Acid Solutions at Pressures of 100 and 1200 mm. W. D. and L. G. Bonner and F. J. Gurney.................... 3087
Theory of Water and Ionic Solution, with Particular Reference to $\dot{H}$ and OH' Ions. J. D. Bernal and R. H. Fowler.................... 3951
Fine Structure of Trinitrobenzene Derivatives. E. Hertel and G. H. Römer 4331
Increase of the Concentration of H^1H^2 by Fractional Evaporation and Rectification. W. H. Keesom, H. van Dijk and J. Haantjes................ 4718
Isopycnals of Liquid Helium. Part I. W. H. and (Miss) A. P. Keesom.................... 4754, 4755
Solid-Liquid-Air Contact Angles and their Dependence upon the Surface Conditions of the Solid. F. E. Bartell and A. D. Wooley.............. 4792
Densities and Parachors of Vinyl Acetate and Its Liquid Polymers. C. Green, J. Marsden and A. C. Cuthbertson.................... 5134
See also 2466 *under* 3; 5135 *under* 4.

3. Density of Solids.

Physical Properties and Structure of the Binary System Iron-Cobalt. A. Kussmann, B. Scharnow and A. Schulze.................... 28
Structure of Potassium Osmiamate. F. M. Jaeger and J. E. Zanstra........ 31
Structure of Caesium Osmiamate. F. M. Jaeger and J. E. Zanstra 32
Structure of Ammonium, Rubidium, and Thallium Osmiamates. F. M. Jaeger and J. E. Zanstra.................... 33
Influence of Foreign Substances on the Cohesion Limits and Ultramicroscopic Sol-Formation of Synthetic Rock-Salt Crystals. Part III. Heavy Metal Chlorides. W. Metag. Part IV. Density Determination. J. Köhler 40
Investigation of the Cooling of Glowing Silit Rods by Photographic Pyrometry. R. Hase.................... 287
Temperature Variation of the Thermal Conductivity of Pyrex Glass. R. W. B. Stephens.................... 645
Relation between the Composition and the Density and Optical Properties of Glass. Part I. Soda-Lime-Silica Glasses. G. W. Morey and H. E. Merwin.................... 1029
X-Ray Investigation of 12-Molybdophosphates and Related Compounds. J. L. Hoard.................... 1290
Density of Soda-Lime-Silica Glasses as a Function of the Composition. F. W. Glaze, J. C. Young and A. N. Finn.................... 1306
X-Ray Study of Ferrous Oxide Solid Solutions. E. R. Jette and F. Foote.. 1529
Precision Measurements of Crystal Parameters. E. A. Owen and E. L. Yates 1683
Lattice Structure of Indium. E. Zintl and S. Neumayr.................... 1684
Phlorizin Crystals. P. Gaubert.................... 1694

Density, *continued.*

Abstract Nos.

Crystal Structure of Silver Per-rhenate. F. Buschendorf 2143
Physical Properties of Ethylamine. E. Pohland and W. Mehl 2466
Thermodynamic Properties of Fused Salt Solutions. Part VII. Zinc Bromide in Lead Bromide. E. J. Salstrom 2502
Chemical and Crystallographic Investigations on Ammonium, Potassium, Rubidium, Cæsium and Thallium Cobaltinitrites. A. Ferrari and C. Colla 2705
Molecular Refraction of Alums. K. Wendekamm 3001
Annealing of Glass as a Physical Problem. L. H. Adams 4156
X-Ray Analysis of Zirconium Tungstide ZrW$_2$. A. Claassen and W. G. Burgers 4325
Hall Effect and other Physical Constants of Alloys. Part I. Lead Bismuth Series of Alloys. W. R. Thomas and E. J. Evans 4666
Crystal Structure of Cæsium, Thallium and Rubidium Per-rhenates. F. M. Jaeger and J. Beintema 4740
Optical Properties, Densities and Solubilities of the Normal Formates of some Metals of Group II of the Periodic System. F. W. Ashton, D. F. Houston and C. P. Saylor 4908
Physical Properties of Glasses of the SiO$_2$-Na$_2$O-K$_2$O-CaO System. W. Hänlein 5367
See also 1307 *under* 4.

4. Apparatus and Technique.

Molecular Weight Micro-Method. A. C. Bratton, Jr., and H. L. Lochte 10
Andreae's Methods for the Determination of the Density of Solids. E. Cohen and W. A. T. Cohen-de Meester 1307
Binary Liquid Systems and the Mixture Rule. W. MacFarlane and R. Wright 1701
A. Ångstrom's Total Immersion Hydrometer. P. F. Gaehr 2159
Isotopic Fractionation of Water. E. W. Washburn, E. R. Smith and M. Frandsen 5041
Determination of Small Changes in the Density of a Liquid. P. C. Vincent 5135
Micropyknometer for Estimation of Variations in the Isotope Ratio of Water. E. S. Gilfillan and M. Polanyi 5136
See also 671, 736, 1302, 1304, 1305, *under* 1; 2398, 4792 *under* 2.

5. Unclassified.

System Carbon Disulphite-Ethylene Dichloride. D. L. Hammick and J. Howard 1131
Partial Molal Volumes of Cobalt Sulphate and of Cadmium Iodide. R. C. Cantelo and H. E. Phifer 2722

Dielectrics and Capacitance.

1. Theory.
2. Dielectric Constants and Electric (Dipole) Moments:
   - (*a*) Solids.
   - (*b*) Gases.
   - (*c*) Liquids and Colloids.
3. Effects of Electric and Magnetic Fields.
4. Effect of Frequency.
5. Effects of Mechanical Stress, Temperature and Moisture.
6. Dielectric Loss.
7. Capacitance and its Measurement.
8. Unclassified.

Cross-References:
Refractive Index of Dielectrics, *see* Reflection, Refraction and Dispersion (Radiation), 4.
Electric Breakdown, *see also* Section B.—Electrical Engineering.

1. Theory.

Problems of Electric Images in Dielectrics. Part I. J. J. Weigle 354
A.C. Capacities of Electrolytic Condensers. F. W. Godsey, Jr 1188
Potential Gradients in Anodic Films. F. W. Godsey, Jr. 1189
Cryoscopic Rules and Dipole Theory. W. Fischer 1943
Calculation of Electric Moments. G. Allard 3175
Polarisabilities of Ions from Spectra. J. E. and Maria G. Mayer 3176
Electric Polarisability and Diamagnetic Susceptibility of Molecules. S. Bhagavantam 3828
Integration of the Equations of Maxwell-Hertz for Uniaxial Crystalline Media. A. Tonolo 3837
Theory of Water and Ionic Solution, with Particular Reference to H˙ and OH′ Ions. J. D. Bernal and R. H. Fowler 3951
See also 5031 *under* 2 (*c*).

For the Key to this Index see pp. 1358 to 1372.

Dielectrics and Capacitance, *continued.*

2. Dielectric Constants and Electric (Dipole) Moments.

Abstract Nos.

(*a*) *Solids.*
Dipole Moments of Naphthols. M. Puchalik ... 355
Dipole Moments of Unsaturated Compounds. Part I. I. M. A. Bruyne, Rosa M. Davis and P. M. Gross ... 356
Dipole Rotation in Crystalline Solids. C. P. Smyth and C. S. Hitchcock ... 1173
Dipole Moment of Nitric Oxide. C. P. Smyth and K. B. McAlpine ... 1611
Dipole Rotation in Certain Crystalline Solids. S. E. Kamerling and C. P. Smyth ... 2018
Electric Moments of Hydrazine and Its Derivatives. L. F. Audrieth, W. Nespital and H. Ulich ... 2019
Method for the Determination of the Dielectric Constants of Powders. K. Højendahl ... 2027
Dispersion and Polarisability and the van der Waals Potential in the Alkali Halides. J. E. Mayer ... 2563
Ionic Polarisation in Crystals. J. Errera and H. Brasseur ... 3177
Investigation of the Dielectric Properties of Rochelle Salt by Means of X-Rays. H. Staub ... 3178
Determination of the Dielectric Constants of Semi-Conductors and of Rochelle Salt. G. Oplatka ... 3179
Electric Properties of Isomorphous Crystals. M. Eremejew and B. Kurtschatow ... 3267
Dielectric Polarisation in Solid Bodies. J. Errera ... 3778
Space-Charges in Ice. G. Oplatka ... 3779
Dipole Rotation and the Transition in the Crystalline Hydrogen Halides. C. P. Smyth and C. S. Hitchcock ... 3780
Unipolarity of the Polarisation in Rochelle-Salt Crystals. I. Kurtschatow ... 4644
Anomalous Dispersion of the Dielectric Constant of Rochelle Salt. G. Busch 4645
Specific Inductive Power and Water of Crystallisation of Alums. J. Errera and H. Brasseur ... 4646
See also 1238, 3183 *under* 3; 2017 *under* 6.

(*b*) *Gases.*
Dielectric Constants of Ethyl Alcohol Vapour. H. L. Knowles ... 357
Ionisation of Gas in a Magnetic Field. T. V. Ionescu and C. Mihul ... 716
Dependence of the Dielectric Constants of Gases on Temperature and Density. H. H. Uhlig, J. G. Kirkwood and F. G. Keyes ... 2020
Electric Polarisation in Vapours. U. Grassi ... 2021
Polarity in Certain Hydrocarbon Vapours. K. B. McAlpine and C. P. Smyth 2028
Atomic Polarisation. C. P. Smyth ... 2564
Influence of Pressure on the Dielectric Constant of Carbon Dioxide up to 1000 Atmospheres between 25° and 150° C. A. and (Mrs.) C. Michels ... 2565
Deflection of Molecular Rays in an Electric Field: Electric Moment of Hydrogen Chloride. I. Estermann and R. G. J. Fraser ... 3781
Electric Moments of NO_2 and N_2O_4. C. T. Zahn ... 3782
See also 355, 356 *under* 2 (*a*); 2567, 2577 *under* 2 (*c*); 736, 4650 *under* 5.

(*c*) *Liquids and Colloids.*
Saturation State of a Dipole Liquid in the Neighbourhood of an Ion. S. Oka ... 358
Dipole Moments and Molecular Structure. Part III. Oxychlorides of Sulphur. J. W. Smith ... 359
Electric Moments of Esters of Fatty Acids. C. T. Zahn ... 360
Dependence of Dipole Moment Measurements on the Solvent. H. Müller ... 361
Structure of Surface Films. Part XVI. Surface Potential Measurements of Fatty Acids on Dilute Hydrochloric Acid. N. K. Adam and J. B. Harding 496
Surface Potentials of Unimolecular Films. Part IV. Effect of Underlying Solution and Transition Phenomena in the Film. J. H. Schulman and A. H. Hughes ... 497
Liquid Nitrobenzol Near the Melting Point. J. Wellm ... 650
Heats and Nature of Combination of Organic Molecular Compounds. G. Briegleb and T. Schachowskoy ... 658
Dielectric Constants of Some Organic Solvent-Water Mixtures at Various Temperatures. G. Åkerlöf ... 732
Physico-Chemical Method of Analysis in Organic Solution by Measurement of the Dielectric Constant. A. Chrétien and P. Laurent ... 733
Dielectric Constant and Particle Size. J. W. Williams and J. L. Oncley ... 1174

Dielectrics and Capacitance, *continued.*

Abstract Nos.

Dielectric Constants of the Aqueous Solutions of Some Amino-Acids and Polypeptides. M. Frankenthal 1175
Importance of Dipole Measurements for the Stereochemistry of Carbon. E. Bergmann and W. Schütz 1176
Electric Moments of Cyclohexane Derivatives. O. Hassel and E. Naeshagen 1177
Studies in Dielectric Polarisation. Parts II, III and IV. E. C. E. Hunter and J. R. Partington 1178
Liquid Crystal Character of Dipole Liquids at the Melting Point. L. S. Ornstein, W. Kast and P. J. Bouma 1296
Properties of Electrolytic Solutions. Part I. Conductance as Influenced by the Dielectric Constant of the Solvent Medium. C. A. Kraus and R. M. Fuoss 1604
Configurations of the Aldoximes from Measurements of Electric Dipole Moment. T. W. J. Taylor and L. E. Sutton 1612
Dielectric Polarisation. Part V. Benzene Solutions of Pyrones, Thiopyrones and Thioketones. Dioxan Solutions of Ureas and Thioureas. E. C. E. Hunter and J. R. Partington 1613
Measurement of Dipole Moments by Means of a Molecular-Ray Method. M. Wohlwill 1614
Dielectric Constant of Aqueous Solutions. M. Ježewski 1615
Dielectric Polarisation of Solutions of Sulphur in Carbon Disulphide. S. Dobinski 2022
Dipole Moment of Hydrogen Peroxide. W. Theilacker 2023
Dielectric Constant of Liquid Sulphur. H. J. Curtis 2024
Orientation of Non-Polar Molecules by Dipoles. J. Weigle 2025
Dependence of Dipole Moment of Dichloroethane on the Temperature and Solvent. S. Mizushima and K. Higasi 2026
Freezing Points of Solutions of Nitrobenzene in Benzene and Cyclohexane, and their Relations to the Electrical Polarisation. L. G. Davy and N. V. Sidgwick 2479
Dielectric Polarisation. Parts VI and VII. E. C. E. Hunter and J. R. Partington 2566
Induction between Bond Moments in Halogenated Methanes. C. P. Smyth and K. B. McAlpine 2567
Dipole Moments and Structures of Long-Chain Molecules. C. P. Smyth and W. S. Walls 2568
Dipole Moments and Structures of Organic Azides and Aliphatic Diazo-Compounds. N. V. Sidgwick, L. E. Sutton and W. Thomas 2569
Dipole Moments of Benzene Derivatives with Freely Rotatable Substituents. J. W. Williams. Comments by H. L. Donle 2570
Electric Moments of Stannic Chloride and Some of Its Derivatives. W. E. Spaght, F. Hein and H. Pauling 2571
Dipole Moments of Certain Benzene Derivatives. H. Poltz 2572
Dielectric Constants of Solutions of Amino Acids and Peptides. Dipole Moments of Esters of Amino Acids and Peptides. J. Wyman, Jr., and T. L. McMeekin 2573
Dispersion of Short Waves. R. Luthi 2574
Electric Moment as a Measure of the Ionic Nature of Covalent Bonds. J. G. Malone 2577
Dipole Moments of Mercaptans and Sulphides. W. S. Walls and C. P. Smyth .. 3180
Dielectric Constants of Aqueous Solutions of Amino-Acids and Polypeptides. M. Frankenthal 3181
Ultra-Violet Absorption of Benzene Derivatives. Part II. K. L. Wolf and O. Strasser 3581
Dielectric Constant of Liquid Iodine. A. Jagielski 3783
Dielectric Polarisation of Liquid Phosphorus. S. Dobiński 4236
Dependence of Dipole Moments on Solvents, and on the Infra-Red Terms and Binding Moments. O. Fuchs and H. L. Donle 4237
Composition of Electric Moments of Polyalcohols: Moments of Associated Dipoles. P. Girard and P. Abadie 4238
A.C. Conductivity and Dielectric Constant of Electrolytes. P. Wenk 4637
Effect of Viscosity upon the Conductivity and Dielectric Constant of Electrolytes. O. Dobenecker 4638
Conductivities and Dielectric Constants of Liquids in H.F. Fields. M. Wien .. 4639
Free Rotation and the Electric Moments of Diacetyl, Acetylacetone, Acetic Anhydride, and Acetoacetic Ester. C. T. Zahn 4647

For the Key to this Index see pp. 1358 to 1372.

Dielectrics and Capacitance, *continued*.

Abstract Nos.

Dipole Moment and Association. G. Berger 4648
Dipole Moment and Solvent. H. Müller 5031
Dielectric Polarisation. Parts VIII-XI. E. G. Cowley and J. R. Partington 5032
Electric Moments in Solution by the Temperature Coefficient Method. Part I. Experimental Method and Electric Moments of Benzyl Compounds. F. Fairbrother 5033
H.F. Dielectric Constants of Aqueous Solutions. E. Plötze 5416
Dielectric Constant and Absorption of Several Organic Fluids at 1·82 m. W. T. Szymanowski 5417
Dipole Moments of the Monomethyl-and Dimethyl-butadienes. E. H. Farmer and F. L. Warren 5418
Dipole Moment and Group Rotation. Part I. Moments of Chloro- and Nitrobenzyl Chlorides and the Effect of Group Separation. J. M. A. de Bruyne, R. M. Davis and P. M. Gross 5419
Electric Moments of Cyclic 1 : 1-Dicarboxylic Esters in Relation to the Valency Deflection Hypothesis. E. H. Farmer and N. J. H. Wallis 5420
See also 356, 1173, 2019, 2027, 3778 *under* 2 (*a*) ; 1179, 3184, 4239 *under* 4 ; 3285, 4651, 4652 *under* 7.

3. Effects of Electric and Magnetic Fields.

Behaviour of Thin Films of Cellulose Varnish in Electric Fields. A. Mainka 734
Variation of Dielectric Constant of Quartz with Applied Potential. H. Saegusa and K. Nakamura 735
Piezoelectric and Dielectric Characteristics of Rochelle Salt. E. Schwartz 1238
Electric Spark and its Preliminary Discharges. A. v. Hippel 1580
Current and Field Characteristics in Insulating Material with a Single Thin Removable Surface Charge. W. O. Schumann 2562
Current and Field Behaviour in Insulating Materials with Thin Mobile Charged Layers. W. O. Schumann 3182
Lower Curie Point of Rochelle Salt. B. and L. Kurtschatow 3183
New Method for the Determination of Electrostriction in Gases. J. Jaumann 3185
Molecular Orientation of Molecules with Permanent Moment in an Alternating Field. Application of the Dispersion of the Dielectric Constant and the Kerr Effect. Y. Rocard 3483
Electrical Conductivity of Solids in Strong Fields. A. v. Hippel 4634
Electrostriction Produced by Salts in some Aliphatic Alcohols. W. C. Vosburgh, (Miss) L. C. Connell and J. A. V. Butler 4649
Influence of a Magnetic Field on the Dielectric Constants of Argon and Oxygen. H. Voss 5034
See also 3178, 3179 *under* 2 (*a*) ; 716 *under* 2 (*b*) ; 1174, 2574 *under* 2 (*c*).

4. Effect of Frequency.

Electrostatic Theory of the Frequency-Dependence of Ionic Mobilities and Dielectric Constants in Mixed Solutions of Strong Electrolytes. H. Falkenhagen and W. Fischer 1179
Dispersion of Undamped Ultra-Short Waves. M. Seeberger 1653
Frequency Variation of the Dielectric Constant of Dilute Non-Aqueous Solutions. J. L. Oncley and J. W. Williams 3184
Electrostatic Theory of the Frequency-Dependence of Ionic Mobilites and Dielectric Constants in Mixed Solutions of Strong Electrolytes. H. Falkenhagen and W. Fischer 4239
H.F. Properties of Dielectrics. K. Nakamura 5035
See also 1173, 2018, 3778, 3780, 4645 *under* 2 (*a*) ; 2574, 4637, 4638, 4639, 5417 *under* 2 (*c*) ; 2562, 3182 *under* 3 ; 5036 *under* 5 ; 2017 *under* 6.

5. Effects of Mechanical Stress, Temperature and Moisture.

Variation of Dielectric Constant with Temperature. Part II. Electric Moments of Ethylene Halides. E. W. Greene and J. W. Williams 736
Temperature and Pressure Dependence of the Dielectric Constants of the Vapours of Bromine and of Iodine Chloride K. F. Luft 4650
Effect of Temperature and Frequency on the Dielectric Constant, Power Factor and Conductivity of Compounds of Purified Rubber and Sulphur. A. H. Scott, A. T. McPherson and H. L. Curtis 5036
See also 1173, 3178, 3780, 4645 *under* 2 (*a*) ; 2020, 2028, 2565 *under* 2 (*b*) ; 360, 732, 2026, 3783 *under* 2 (*c*) ; 735, 3183 *under* 3 ; 2575 *under* 6 ; 1616, 2578 *under* 7.

Dielectrics and Capacitance, *continued.*

6. Dielectric Loss.

Abstract Nos.

Binary Liquid Systems and the Mixture Rule. W. MacFarlane and R. Wright 1701
Dielectric Loss in Glasses in Relationship to their Composition. F. Keller 2017
Dielectric Losses in Rock-Salt. P. L. Bayley 2575
Thermal Instability in Cylindrical Condensers due to Dielectric Losses. B. L. Goodlet 4240
Power Loss Phenomena in Liquid Dielectrics. W. Jackson 5421
See also 355 *under* 2 (*a*) ; 2565, 3781 *under* 2 (*b*) ; 2024, 3783, 5417 *under* 2 (*c*) ; 734, 2562, 3182 *under* 3 ; 3184 *under* 4 ; 3131 *under* 7.

7. Capacitance and its Measurement.

Measurement of a Small Capacity. H. Lampe 737
Capacitance Hygroscopy and Some Applications. W. L. Balls and R. K. Schofield 1616
Standard Capacities of the Physikalisch-Technische Reichsanstalt. E. Giebe and G. Zickner 2578
Measurement of Power Factor and Capacitance of a Condenser by Comparison with a Mutual Inductance. A. W. Smith 3131
Capacity of Electrometers. H. Benndorf 3214
Sources of Error in Capacity Measurements with Sensitive Electrometers. E. Sienkiewicz 3215
Parallel Plate Condenser with Negative Capacity. H. Benndorf 3216
Determination of the Angles between Covalencies from Measurements of Electric Dipole Moment. G. C. Hampson and L. E. Sutton 3285
Capacity of a Long Wire. F. H. Murray 4235
Dielectric Constants of Organic Liquids. S. Sugden 4651
Dielectric Constants of Dilute Strong Electrolytes. M. Jezewski and J. Kamecki 4652
Correction for Plane Condensers. F. Keller and W. R. Lehmann 5037
Capacity Meter. W. L. Beck 5038
Capacity of Dolezalek Electrometers. G. Nadjakoff 5060
Effective Capacity of the Lindemann Electrometer. J. J. McHenry 5062
Calculation of the Capacity of a Condenser with Inclined Circular Plates. H. Nitka 5422
See also 1188 *under* 1 ; 734 *under* 3.

8. Unclassified.

Use of Dipole Moment Data. H. M. Smallwood 738
Electric Penetration of Dielectric Liquids as Static Ionisation. H. Eisler 739
Velocity Distribution of the Secondary Electrons Liberated from Insulators. G. Kalckhoff 1632
Rôle of Dissolved Gases in Determining the Behaviour of Mineral Insulating Oils. F. M. Clark 2029
Electrical Breakdown of Liquids by Means of the Electro-Optical Shutter. H. W. Washburn 2576
Electric Moments by the Molecular-Ray Method. I. Estermann and M. Wohlwill 2579
Adsorption in Solutions and Physical Properties of the Solvent. Part II. E. Heymann and E. Boye 2667
Unipolar Form of Surface Corona. A. Coehn and W. Ziegler 3730
Dielectric Strength of Thin Ta_2O_5 Films. G. Just 3784
Resistance to Penetration of Extremely Thin Layers of Ta_2O_5 and Al_2O_3 in Dependence on the Thickness of the Layer. H. Betz 3785
Molecular Structure of Polyhydric Alcohols Deduced from their Dispersion and Absorption for Radio-Frequencies. P. Girard and P. Abadie 3786

Diffusion and Osmosis.

1. Diffusion (General).
2. Osmosis.
3. Membrane Equilibria.
4. Apparatus.

Cross-References :
Association, *see* Atomic and Molecular Structure, 9.
Electroosmosis, *see* Colloids, 2*b*.

1. Diffusion (General).

Theory of Diffusion. B. Bružs 44
Diffusion of Alcohols. G. Franke 45

Diffusion and Osmosis, *continued.*

Abstract Nos.

Absorption from a Streaming Gas. H. v. Wartenberg and M. Brzezinski 46
Absorption and Classical Diffusion. A. T. McKay 47
Diffusion of Gases through Fused Quartz. Liu Sheng T'sai and T. R. Hogness 48
Diffusion of Helium through Glass. W. D. Urry 49
Dissociation-Heat of the Lead Lattice. G. v. Hevesy, W. Seith and A. Keil .. 441
Friction, Thermal Conductivity and Diffusion in Gaseous Mixtures. Parts XXI, XXII, and XXIII. M. Trautz 643, 3079, 3080
Irreversible Processes in Electrolytes: Diffusion Conductance and Viscous Flow in Arbitrary Mixtures of Strong Electrolytes. L. Onsager and R. M. Fuoss 741
Rotation of Crystals Floating on Liquid Surfaces. P. Gaubert 860
Diffusion in Liquids. Part I. R. Fürth. Parts II and III. R. Zuber. Part IV. R. Zuber and K. Sitte. Part V. K. Sitte 861
Dried Collodion Membrane. L. Michaelis 1270
Periodic Precipitation of Mercuric Iodide. Suzanne Veil 1282
Kinetic Theory of Fluids. R. O. Herzog and H. C. Kudar 1327
Relation between Solubility and Diffusion of Gases in Liquids. J. Horiuti 1350
Diffusion of Electrolytes. R. J. Davies 1702
Diffusion of Colloidal Electrolytes: Sodium Oleate. M. E. L. McBain 1703
Diffusion in Standard Cells. G. A. Hulett and R. B. Elliott 2030
Diffusion of Thorium in Tungsten. G. R. Fonda, A. H. Young and Amy Walker 2092
Function Equation of Eddy Diffusion. O. F. T. Roberts 2160
Diffusion of Gas at Low Pressures. J. Rotblat 2161
Classical Statistics and Quantum Mechanics. R. Fürth 2225
Boundary Layer of Dilute Electrolytes and the Diffusion Potential. Shu-Tsu Chang 2592
Pore Distribution and Filter Action of Ultra-Filters and Animal Membranes. M. Pisa 2693
Diffusion in Crystals. G. v. Hevesy 2721
Velocity of Diffusion of Metals in Gold and Silver. W. Jost 2723
Diffusion of Monatomic Gases Through Fused Silica. T. Alty 2724
Diffusion of Mercury on Rolled Tin Foils. F. W. Spiers 2725
Electrical Conduction and Diffusion in Solid Silver Sulphide, Selenide and Telluride, and the Mechanism of their Formation from the Elements. C. Tubandt, H. Reinhold and Annie L. Neumann 3166
Ludwig-Soret Effect and Ionic Mobility in CuBr-AgBr Mixed Crystals. H. Reinhold and R. Schulz 3192
Diffusion of Helium Through Quartz: Relation to Temperature. E. F. Burton, E. O. Braaten and J. O. Wilhelm 3306
Self-Diffusion of Hydrogen. P. Harteck and H. W. Schmidt 3307
Diffusion of Hydrogen Through Platinum and Nickel and Through Double Layers of These Metals. W. R. Ham 3308
Determination of Pore Distribution According to Dimensions in Filters and Ultra-Filters. F. Erbe 3309
Permeability of Porous Media for Homogeneous Fluids. R. D. Wyckoff, H. G. Botset, M. Muskat and D. W. Reed 3435
Calorimetric Method for Determining the Rates of Interdiffusion of Reacting Liquids. F. Barry and A. K. Smith 3666
Diffusion and Electrolytic Conduction in Crystals (Ionic Semiconductors). W. Jost 3762
Periodic Precipitation. R. Fricke 3890
Free Paths and Transport Phenomena in Gases and the Quantum Theory of Collisions. Part I. Rigid Sphere Model. H. S. W. Massey and C. B. O. Mohr 3940
Relation between Electrolytic Conductivity and Self-Diffusion and Crystallographic Direction. W. Seith 4227
Properties of Gelatin in the Electric Field. Suzanne Veil 4316
Diffusion-Problems. P. Clausing 4341
Optical Determination of the Diffusion Constant of Sodium. L. A. Ginsel and L. S. Ornstein 4342
Diffusion of Helium through Crystalline Substances and the Molecular Flow through Rock Masses. W. D. Urry 4343
Thermo-E.M.F. and Ludwig-Soret Effect in Solid Salts and Mixed Crystals. H. Reinhold 4632
Electrical Conductivity and Diffusion in Non-Metallic Solids. C. Tubandt 4633

For the Key to this Index see pp. 1358 to 1372.

Diffusion and Osmosis, *continued*.

Abstract Nos.
Diffusion of Metals in Mercury. F. Weischedel 4752
Boundary Conditions in Two-Dimensional Elastic Theory. N. Muschelišvili 4753
Discontinuous Diffusion in Gelatin. Suzanne Veil 5115
Diffusion Coefficients of Bromine-Argon, Bromine-Methane, Bromine-Hydrogen Chloride, Bromine-Nitrous Oxide. J. E. Mackenzie and H. W. Melville 5137
Evaporation and Diffusion of Volatile Materials into an Inert Gas Stream. E. Preston 5369
See also 50 *under* 2 ; 420, 2676, 2727 *under* 4. 861

2. Osmosis.

Determination of the Magnitude, Shape and Solvation of Macro-Molecules. G. V. Schulz 20
Osmotic Pressure and the Permeability of Membranes. W. W. Lepeschkin.... 50
Experimental Study of Negative Osmosis. A. Grollman and K. Söllner 445
Mechanism of Anomalous Osmosis. A. Grollman and K. Söllner 446
Osmosis in Systems Consisting of Water and Tartaric Acid. Parts I, II and III. F. A. H. Schreinemakers and J P. Werre 1704
Osmotic Pressure of Nitrocellulose Solutions. J. Grard 2162
Osmotic Pressure by the Method of Isothermal Distillation. Part II. M. Ulmann 2726
Electroosmosis and Anomalous Osmosis. D. R. Briggs 3885
Empirical Equation for Calculating Osmotic Pressures. (Earl of) Berkeley 4344
Theory of Concentrated Solutions of Strong Electrolytes. G. B. Bonino and G. Centola 5179
See also 44 *under* 1 ; 1358, 1359 *under* 3 ; 2727 *under* 4.

3. Membrane Equilibria.

Exact Thermodynamics of Membrane Equilibria. F. G. Donnan and E. A. Guggenheim 665
Films : Physics of Membranes. E. Manegold 835
Membrane Equilibria. F. G. Donnan 836
Properties of the Becquerel Membranes. J. J. Bikerman 1358
Membrane Processes. K. Söllner 1359

4. Apparatus.

Technique for the Separation of Gaseous Isotopes and Application to Neon. G. Hertz 420
Modified Electro Ultra-Filter. D. v. Klobusitzky 839
Permeability of Quartz and Pyrex and Other Glass to Helium. J. C. McLennan and J. O. Wilhelm 1308
Separation of Isotopes by G. Hertz's Method. H. Harmsen 2676
Copper Membrane Gas-Molecule Sieve ; Callendar's Theory of Osmosis. D. L. Warrick and E. Mack, Jr. 2727
See also 861, 3666 *under* 1 ; 1358, 1359 *under* 3.

Dilatation.

1. Expansion Coefficients :
  (*a*) Gases.
  (*b*) Liquids and Solids.
  (*c*) Experimental Methods.
2. Unclassified.
Cross-References :
  Expansion of Rocks, etc., *see* Land, Physics of the, 2 ; *also* Meteorology, 2.
  Expansion of Sea Water, *see* Hydrosphere, Physics of the, 1.
  Thermodynamical Theory, *see* Thermodynamics.

1. Expansion Coefficients.

(*a*) *Gases.*

Non-Uniform Expansion of Zinc Crystals. R. Becker and E. Orowan 1120

(*b*) *Liquids and Solids.*

Physical Properties and Structure of the Binary System Iron-Cobalt. A. Kussmann, B. Scharnow and A. Schulze 28
Light Scattering in Supercooled Benzophenone. W. T. Richards and P. M. Harris 185
Total and Specific Heats of a Series of Fractions of Petroleum, and their Relation to Other Properties. Parts IX-XII. H. R. Lang and R. Jessel 275
Thermal Expansion of Lead. P. Hidnert and W. T. Sweeney 648

Dilatation, *continued.*

Abstract Nos.
Compressibility of Eighteen Cubic Compounds. P. W. Bridgman 866
Some Physical-Chemical Constants of Dioxan. W. A. Roth and Ingrid Meyer 1541
Deviation of Natural Gas from Boyle's Law. T. W. Johnson and W. B. Berwald 1708
Linear, Thermal Expansion of a Single Crystal of Sodium Nitrate. J. B. Austin and R. H. H. Pierce, Jr. 1937
Thermal Expansion of Manganin. A. Schulze 2476
Physical Properties of Compounds of High Melting Point. K. Becker 2482
X-Ray Investigations on the Thermal Expansion of Solids. Part I. G. Shinoda 3672
Absolute Thermal Expansion of Liquids. J. Zahradinček 3673
Thermal Expansion and Lattice Theory. A. Papapetru 3674
Magnetic and Dilatometric Research on Hardening of Steel. W. Jellinghaus 3824
Critical Temperatures in Silicate Glasses. J. T. Littleton 4085
Thermal Expansion of Refractories to 1800° C. R. A. Heindl 4153
Expansion of Boron. E. Dupuy and L. Hackspill 4576
Thermal Expansion of Zinc by X-Ray Method. E. A. Owen and J. Iball...... 4577
Thermal Expansion of Columbium. P. Hidnert and H. S. Krider.......... 4967
Thermal Expansion of Crystals with Layer Lattices. Helen D. Megaw 4968
Thermal Expansion of Quartz by X-Ray Measurements. A. H. Jay 4969
Transformation of Solid Ammonium Chloride at about − 30° C. A. Smits and C. H. MacGillavry 4970
Behaviour of Glass when Slowly Heated with Special Reference to the Thermal Expansion. E. Seddon and W. E. S. Turner.................. 5365
Thermal Expansion of Silica-Soda-Beryllia Glasses. E. Rencker 5366
Physical Properties of Glasses of the SiO_2-Na_2O-K_2O-CaO System. W. Hänlein 5367
Jump in the Expansion Coefficient of Liquid Helium in Passing the λ Point. W. H. Keesom 5377
See also **649** *under* 1 (*c*).

(*c*) *Experimental Methods.*

Measurement of Small Changes of Length. R. Mohr..................... 78
Vacuum Apparatus for Measuring Thermal Expansion at Elevated Temperatures with Measurements on Pt, Au, Mg and Zn. J. B. Austin......... 649
Interference Method of Measuring Thermal Expansion. G. E. Merritt...... 1537
Universal Dilatometer. R. Holcomb................................ 2477
Improvements in Prytherch's Capacity Dilatometer. J. L. Haughton and F. Adcock 3675
See also **4577, 4969** *under* 1 (*b*).

2. Unclassified.

Superficial Dilatation of Elastic Solids. D. Palermo 5368

Dynamical Problems (Astronomical).

Cross-References :
General Dynamics, *see* Mechanics, Classical ; *also* Mechanics, Quantum.

Stellar Perturbations of Nearly Parabolic Orbits. E. Öpik............ 125
Comparison of Methods of Determining Planetary Orbits. N. Stoyko...... 131
Effect of the Tides in Limiting the Motion of a Planetary System. G. Krall 132
New Formulæ for Special Perturbations. H. Roure 133
Einsteinian Correction of Time in a Planetary Motion. M. Cimino 487
Determination of Accelerations and Fluctuations in Motions of Sun and Moon. F. K. Fotheringham 524
Hyperbolic Orbits, Determination of True Anomaly and Time of Perihelion Passage. M. Davidson.. 917
Co-operative Phenomena. F. Zwicky 1700
Newton-Denning Method of Computing Meteor Paths with Celestial Globe. W. J. Fisher 1776
Variable Parameters and Asymptotic Prevision in Some Problems of Celestial Mechanics. G. Krall 2252
Problem of n Bodies Mutually Attracting as Any Power of the Distance. M. Kiveliovitch 2774
Problem of n Bodies with Variable Masses. M. Mendes 2775
Internal Rotation of a Heterogeneous Fluid Ring. P. Dive............... 2845
Problem of Two Bodies with Variable Masses. W. Markowitz.............. 3400

Dynamical Problems (Astronomical), *continued.*

Abstract Nos.

Problem of Two Bodies with Decreasing Mass. E. Merlin.................. 3401

Limitations of Values of Adiabatic Invariants and Problems of Variable Mass. D. Graffi 3402

Orbit of a Double Star. L. Gialanella 3972

Motion of a Planetary System of $(n + 1)$ Bodies. G. Krall.................. 4391

Limiting Values of Adiabatic Invariants and Problems of Variable Mass. D. Graffi 4795

Problem of Two Bodies of Variable Mass. E. O. Lovett.................... 5198

Calculation of Ephemerides in nearly Parabolic Orbits. J. P. Möller........ 5199

Elasticity and Plasticity.

1. Theory.
2. Measurements of Elastic Coefficients.
3. Relations between Elastic Coefficients and other Physical Properties.
4. Plasticity.
5. Photoelasticity.
6. Vibrations and Waves.
7. Strength and Failure Tests.
8. Apparatus and Technique.
9. Unclassified.

Cross-References :

Acoustic Vibrations, *see* Acoustics, 1.

Elasticity of Crystals, *see* Crystal Structure and Properties, 6.

Elastic Properties of Colloids, *see* Colloids, 2*d* and 3*c*.

Piezoelectric Oscillations, *see* Piezoelectricity, 2.

Seismic Effects, *see* Seismology.

V.P.T. Relations, Theoretical, *see* Thermodynamics, 2.

1. Theory.

Elastic Displacement of Plane Systems. A. Giannelli.......................... 51

Bonded Elasticity and its Mathematical Schematisation. E. Volterra...... 447

Static Theory of Plane Arches of Great Curvature. C. L. Ricci........... 448

Stresses in Terms of Harmonic Functions. P. Papcovitch.................. 449

Equilibrium of an Elastic Cylinder. B. Galerkin.............................. 450

Torsional and Flexural Oscillations of a Monocrystalline Rod. E. Goens.... 862

Thick Plate Loaded Uniformly. C. A. Garabedian.............................. 863

Torsion and Flexure of Shafting with Keyways or Cracks. W. M. Shepherd.. 864

New Galton Apparatus for the Solution of the Partial Equations $\Delta U = O$ and $\Delta U = C$. F. Bernstein 891

Variable Rotation of an Elastic Solid. L. Lecornu.......................... 1309

Application of the Absolute Differential Calculus to Physics. C. Kaplan.... 1331

Diametral Compression of a Solid Cylinder. C. Weber........................ 1706

Stress Distribution in Wedges with Arbitrary Boundary Forces. J. H. A. Brahtz 1707

Complex Tensor Equations in the Two-Dimensional Theory of Structures. A. Busemann 1736

Elastic Systems Vibrating under Transient Impulse. M. Biot.............. 1818

Pure Bending of Long, Thin-Walled Tubes. E. Chwalla........................ 2163

Stresses in Cylindrical and Conical Thin Walls. C. M. Moir................ 2164

Calculation of Stresses in Braced Frameworks. R. V. Southwell.......... 2165

Tightness of Teeth. J. L. Synge.. 2166

Calculation Relating to Cylindrical Vessels for Storing Fluids, Subjected to Wind Pressure. K. Girkmann.. 2181

Second Variation of the Elastic Potential of Isotropic Bodies. D. Bonvicini 2728

Geometrical Representation of the Theory of Bent Beams. E. Frola........ 2729

Dynamics of Free Transversal Vibrations of Beams, and Dynamics of the Representative Points in Space of Infinite Dimensions. E. Frola...... 2730

Breakdown of Brittle Materials. L. Prandtl.................................. 2731

Strains and Stresses in a Thin-Walled Cylinder. H. Reissner.............. 2732

Buckling Load for a Rectangular Plate with Four Clamped Edges. G. I. Taylor.. 2733

Stresses in Perforated Plate. Y. Nakagawa 2734

Stability of Elastic Equilibrium. E. Trefftz.................................... 2735

Equilibrium of a Tooth with a General Conical Root. J. L. Synge.......... 2736

New Term in the Equation of Motion in Hydrodynamics and in the Theory of Elasticity. S. Fujiwhara.. 2756

Percussion in Wire. H. Pailloux 2782

Love Waves in Elliptic Coordinates. H. Arakawa.............................. 2906

Surface Strength of Glass and Other Materials. F. W. Preston.............. 3310

Theorem of Three Moments in General Form. F. Y. Tsai 3311

Reciprocal Relation for Linear Systems. A. Bloch............................ 3312

Elasticity and Plasticity, ***continued.***

Abstract Nos.
Temperature Stresses in Walls and Flat Slabs. N. S. Boulton 3676
Equilibrium of an Elastic Circular Plate. H. Ôkubo 3900
Biharmonic Analysis in a Perforated Strip. R. C. J. Howland and A. C. Stevenson 3901
Permanent Stability. H. Juretzek and F. Sauerwald 3902
Deflection of a Cantilever Bar Rotated under End Load. W. Hunter 3903
Flexural Centre and Centre of Twist of an Elastic Cylinder. W. J. Duncan, D. L. Ellis and C. Scruton.. 4345
Electromagnetic Analogy. E. Frola 5067
Equilibrium of a Solid Supported on an Elastic Surface. V. Valcovici...... 5138
Superficial Dilatation of Elastic Solids. D. Palermo.......................... 5368
See also 454, 2174, 2741 *under* 4; 870, 1313, 1711, 1712, 1713, 2737, 5142 *under* 6.

2. Measurements of Elastic Coefficients.

Compressibility of Liquid Helium at 2·7° K. W. H. Keesom and K. Clusius 52
Elasticity of Rubber. H. Staudinger 53
Mechanical Properties and Structure of Nitrocellulose Films. A. V. Blom.... 425
Young's Modulus of Steel. J. Galibourg.. 451
Isothermal and Adiabatic Moduli of Elasticity of Crystallised Quartz. R. de Mandrot 452
Study of Hooke's Law. A. Jaquerod and O. Zuber.............................. 865
Compressiblity of Eighteen Cubic Compounds. P. W. Bridgman........... 866
Measurement of Mechanical Properties of Binary Inorganic Salt Mixtures. K. Laybourn and W. M. Madgin.. 867
Elastic Tension and Magnetic Properties. R. Becker............................ 1215
Rapidly Oscillating Pendulums in Liquids. A. Krebs and H. Landsberg.... 1336
Elastic Constants of Rocks, with a Seismic Application. T. C. Richards 1382
Deviation of Natural Gas from Boyle's Law. T. W. Johnson and W. B. Berwald 1708
Pressure-Volume-Temperature Relations of Fifteen Liquids. P. W. Bridgman 2167
Isotherms for Helium at Low Temperature and High Pressure. E. Buchmann 2168
Temperature Coefficient of Elastic Moduli of Metals and Alloys. G. H. Keulegan and M. R. Houseman.. 2169
Rigidity of the Multiple Crystal. W. Kuntze 2170
Compressibilities and Pressure Coefficients of Resistance of Certain Elements, Compounds and Alloys. P. W. Bridgman 2553
Effect of Pressure on Electrical Resistance of Single Metal Crystals at Low Temperatures. P. W. Bridgman... 2554
Elastic Constants of Woods. J. Stamer and H. Sieglerschmidt............ 2738
Elastic Properties of Gold-Silver Single Crystals. H. Röhl................. 2739
Compressibilities of Gases at Low Pressures and Various Temperatures. W. Cawood and H. S. Patterson.. 3313
Elastic Constant of Aluminium Crystals. E. Goens.............................. 3315
Elastic Constants of Rochelle Salt by a Dynamical Method. R. M. Davies 3316
Measurement of Poisson's Ratio. W. A. Zisman................................. 3904
Temperature Dependence of Young's Modulus for Nickel. J. Zacharias...... 3905
Shear Elasticity of Water Films. B. Derjaguin................................... 4346
Compressibility of Solutions. Part I. Apparent Molal Compressibility of Strong Electrolytes. F. T. Gucker, Jr.. 4347
Young's Modulus and Poisson's Ratio with Reference to Geophysical Applications. W. A. Zisman 4418
Compressibility and Anisotropy of Rocks At and Near the Earth's Surface. W. A. Zisman 4419
Comparison of Statically and Seismologically Determined Elastic Constants of Rocks. W. A. Zisman 4420
Isopycnals of Liquid Helium. Parts I and II. W. H. and (Miss) A. P. Keesom 4754, 4755
Elastic Properties of Alloys and of Mixed Crystal Series. H. Röhl.......... 5139
Elasticity of Ferromagnetic Materials. M. Kersten............................... 5140
Theory and Use of Interference Refractometer. H. Schardin.................. 5279
See also 3902, 4345 *under* 1; 4818 *under* 6; 1280, 1714, 1715, 2743 *under* 8.

3. Relations between Elastic Coefficients and other Physical Properties.

Light Scattering in Supercooled Benzophenone. W. T. Richards and P. M. Harris 185

Elasticity and Plasticity, ***continued.***

Abstract Nos.

Optical Properties of Solids and Liquids under Ultrasonic Vibrations. R. Lucas and P. Biquard 569
Physical Properties of Compounds of High Melting Point. K. Becker.......... 2482
Recovery of the Electrical Resistance of Binary Mixed Crystals of Copper, Silver and Gold from the Consequences of Mechanical Treatment when Cold. G. Tammann and K. L. Dreyer 2550
Recovery from Mechanical Treatment when Cold in Iron and Nickel. G. Tammann and G. Moritz 2551
Recovery of Electrical Resistance and of Hardness of Binary Iron Mixed Crystals from the Consequences of Mechanical Stress when Cold. G. Tammann and V. Caglioti 2552
Magnetism and Disturbance of the Crystal Lattice. X-Ray Investigations of α-Iron. F. Regler 3230
Influence of the Intensity of Magnetisation upon the Modulus of Elasticity and Damping of Natural Vibrations of Ferromagnetic Materials. O. v. Auwers 3235
Influence of Elastic Extension of Ferromagnetic Material at the Curie Point. M. N. Michejew 3236
Brittleness, Plasticity and the Gliding Elements of α-Iron. F. Sauerwald and H. G. Sossinka 3314
Magnetic Analysis of Internal Stresses. Part II. M. Kersten 3822
Mechanical Properties of Wetted Rock-Salt Crystals. N. Dawidenkow and M. Classen 4339
Lattice Distortion in Nitrided Steels. W. A. Wood.......... 4758
Decrease of the Interfacial Energy and Increase of the Dispersibility of Solids on the Formation of an Adsorption Layer. P. Rehbinder and N. Kalinowskaja 5096
See also 3902 *under* 1; 866, 867, 1215, 2167, 2553, 2554, 3313, 5140 *under* 2; 869, 2172, 2173, 3911 *under* 4; 56 *under* 6; 1280 *under* 8.

4. Plasticity.

Plastic Extension of α-Iron Crystals. W. Fahrenhorst and E. Schmid 54
X-Ray Study of the Plastic Working of Magnesium Alloys. L. G. Morell and J. D. Hanawalt 55
Mechanism of Plasticity. N. J. Seljakow 453
Plasticity and Creep in Solids. H. Jeffreys 454
Surface Properties of Rubber. E. Vellinger.......... 457
Affinity of Rubber for " Fillers." E. Vellinger.......... 458
Resistivity of Polycrystalline Wires in Relation to Plastic Deformation and Mechanism of Plastic Flow. E. N. da C. Andrade and B. Chalmers 720
Solid Viscosities of Metals. K. Sezawa and K. Kubo 868
Viscosity, Elasticity and Plastic Strength of Flour-Dough. R. K. Schofield and G. W. S. Blair 869, 2173, 3911
Application of Boltzmann's Principle to Certain Kinds of Movement. G. I. Pokrowski 1386
Annealing of Plastically-Deformed Rock-Salt Crystals. N. A. Brilliantow and I. W. Obreimow 2155
Plasticity and Hardness of Crystals of Alkali Metal Halides. K. Przibram 2171, 5141
Nature of " Yield-Value." G. W. S. Blair.......... 2172
Theory of Visco-Elasticity. J. H. C. Thompson 2174
Plastic Properties of Asphaltic Bitumen. R. N. J. Saal and G. Koens 2175
Mechanism of Plastic Deformation. A. W. Stepanow.......... 2176
Rate of Deformation of a Loaded Bar. P. Melchior and H. Deutler.......... 2177
Connection between Distortion and Recrystallisation Capacity in Plastic Deformation of Metals. W. G. Burgers and J. J. A. P. van Amstel 2178
Surface Waves in a Visco-Elastic Medium. T. Itoo.......... 2741
Energy Absorbed in Cold-Working of Metals. W. Rosenhain and V. H. Stott 2742
Internal Friction in Coarse Disperse Systems. B. Iliin, T. Massillon and N. Zacharoff 2832
Plasticity in Single Crystals. H. Schlechtweg 3317
Deformation of Elastic Plasters. E. Almansi 1705, 3318, 4757
Plastic Properties of Unvulcanised Rubber Stocks at High Rates of Shear. J. H. Dillon and N. Johnston 3319
Plasticity and Mechanical Twinning in Quartz. K. Zinserling and A. Schubnikow 3910
Electromagnetic Measurement of Internal Friction. L. Polotowsky.......... 3960

Elasticity and Plasticity, *continued.*

Abstract Nos.

Binding Forces in the Alkali and Alkaline Earth Metals According to the Free Electron Theory. O. K. Rice 4303
Mechanical Properties of Disperse Systems. Part I. Deformations of Building Ground by Pressure. G. I. Pokrowski and W. G. Bulytschew 4311
Deformation Mechanism of Fibrous Materials. O. Kratky 4315
Plasticity in Single Crystals. W. G. Burgers and Schlechtweg 4348
Cohesion and Plasticity in Crystals. A. Smekal 4349
See also 1309, 3903 *under* 1; 53, 425, 865 *under* 2; 3314, 3822 *under* 3; 56, 1712 *under* 6; 3907 *under* 7.

5. Photoelasticity.

Resistance to Disruption of Crystals of Rock-Salt. L. Piatti 1709
Recrystallisation and Hardening of Aluminium due to Plastic Torsion. A. E. van Arkel and M. G. van Bruggen 1710
Photoelasticity. M. Biot 2179
Interference Fringes in Stress Analysis. M. M. Frocht 3912
New Method of Deriving Stresses Graphically from Photoelastic Observations. H. Neuber 3913
Relation between Strain and Photoelastic Effect in Phenolite. J. Kuno 4350
See also 2734 *under* 1; 3230 *under* 3; 3317 *under* 4.

6. Vibrations and Waves.

Time of Relaxation of Heated Copper and Aluminium Wires in Torsional Vibration. D. Schenk 56
Theory of a Resonance Vibration Absorber. O. Föppl 57
Theory of a Vibration Absorber. G. Bock 58
End Pressures on a Damped Oscillating Bar. K. Sezawa 59
Vibrations of One-Storied Framed Structures. K. Sezawa and K. Kanai 60
Theory of the Frahm Vibration Recorder. W. Meyer zur Capellen 61
Particular Oscillations of a Flat Spring. J. Jaumann 455
Transverse Vibrations of a Loaded Bar. K. Sezawa and K. Kanai 870
Elastic Vibrations of a Mass on a Flat Spring. M. Rössiger 871
Critical Torsional Oscillations of a Rotating Accelerated Shaft. M. Biot 872
Principle of Reciprocity Applied to Mechanical Vibrations. A. Steinheil 1311
Analysis of Compound Wave-Forms. J. S. Thompson 1312
Solution of an Equation of Wave Motion. S. Soboleff 1313
Triple Interferometer for Distinguishing Flexural and Longitudinal Vibrations in Quartz. H. Osterberg 1436
Two-Dimensional Elastic Wave due to Double Source. S. Higuchi 1711
Forced Oscillations in an Elastic Rod. S. Higuchi 1712
Diffraction of Plane Waves. S. Soboleff 1713
Impulsive Vibrations. R. Förster 2737
Elastic Waves from a Point in an Isotropic Heterogeneous Sphere. R. Yosiyama 2907
Vibrations in Rods and Discs. G. S. Field 3320
Velocity of Elastic Waves in Granite and Norite. L. D. Leet 4818
Torsional Oscillations in a Conical Rod. B. Sen 5142
Theory of Forced Double Refraction. K. F. Herzfeld and R. H. Lee 5305
See also 862, 1818, 2730 *under* 1; 868, 2741 *under* 4.

7. Strength and Failure Tests.

Bursting Strength of Glass Tubes. H. v. Wartenberg 62
Central Deflection of a Square Plate with Clamped Edges Subject to a Uniform Pressure over one Face. K. R. Gunjikar and V. D. Majmudar 63
Reticular Distortion and Internal Stresses of Metals. V. Montoro 64
Numerical Solution of Stability Problems. A. F. Cornock 456
Fine Structure and Mechanical Properties of Fibres. H. Mark 1271
Tensile Properties of Silk Filaments. W. S. Denham and T. Lonsdale 1277
Number of Pieces Resulting when Fragile Balls are Broken on a Hard Plate. S. Suzuki 1314

For the **Key** to this Index see pp. 1358 to 1372.

Elasticity and Plasticity, *continued.*

Abstract Nos.

Low-Temperature Tensile Strength of Rock-Salt. W. Burgsmüller 1315
Tensile Strength of Mica. E. Orowan 2740
Strength of Thin Cylindrical Shells. W. M. Wilson and N. M. Newmark 3321
Strength under Alternating Load and Decay of Oscillations. M. Hempel 3322
Tensile Strength of Rock-Salt. K. Honda and R. Kimura 3906
Tensile Strength of Crystals. A. Smekal 3907
Influence of Impurity on the Tensile Strength of Rock-Salt. W. Burgsmüller 3908
Tensile Strength of Rock-Salt at 1·2° Abs. K. Steiner and W. Burgsmüller 3909
Pressure Exerted by Granular or Pulverulent Material. Z. Anco 4819
Strength of Glass. J. B. Murgatroyd 5143
Stresses in Flashed Glasses. W. M. Hampton 5144

See also 3310 *under* 1; 425, 867 *under* 2; 869, 2172, 2173, 3911 *under* 4; 1280 *under* 8.

8. Apparatus and Technique.

Calibration of a Pressure Balance in Absolute Units. A. Michels 65
Measurement of Manometric Differences in Level. H. Klumb and T. Haase 66
Improved Vibrograph and Applications. T. Tirunarayanachar 873
Apparatus for Experimenting with Gaseous or Liquid Pressures up to 15,000 Kg./cm.^{2} at all Temperatures. J. Basset 874
Determination of Jelly-Strength and Modulus of Elasticity E_D of Glue Jellies and Influence of Additions on Viscosity and E_D. E. Goebel 1280
Bending of Semicircular Plates and Rings. A. M. Wahl 1714
New Method of Determining Elastic Moduli. P. le Rolland and P. Sorin 1715
Theory of the Oscillation Measurer. H. W. Koch and W. Zeller 1716
Mechanics of Gelation. E. G. Richardson 2116
Capillary Depression of Mercury in Cylindrical Tubes and Errors of Glass Manometers. W. Cawood and H. S. Patterson 2242
Third-Order Aberrations of Seismograph Springs. L. F. Richardson 2295
Improved Apparatus for Static Measurements of Torsional Modulus of Crystal Rods and Application to Single Crystals of Zinc. E. Goens 2743
Tri-Dimensional Vibrograph. J. E. Shrader 2884
X-Ray Measurement of Strain. H. Möller 3657
X-Ray Detection of Lattice Distortion. B. Pfarr 3658
Compressometer for Evaluating Thickness, Compressibility and Compressional Resilience of Textiles and Similar Materials. H. F. Schiefer 3914
Simple Instrument for Meauring Plasticity and Recovery of Soft Materials. J. Hoekstra 4351
Graphical Representation of Two-Dimensional Stress Distributions. V. Tesar 4352
Measurement of Mechanical Resistances by Rotatory Motions. E. Paolini 4367
Sensitive Manometer. P. C. Vincent 5145

See also 891, 2731 *under* 1; 1382, 2167, 3904, 3905 *under* 2; 2742, 3960 *under* 4; 61, 1436 *under* 6; 1277, 2740, 3321, 3322, 3908, 3909 *under* 7.

Electrochemistry.

1. Primary and Secondary Cells.
2. Concentration Cells.
3. Electrolysis.
4. Ionic Mobilities and Transport Numbers.
5. Electrode Potentials and Electrode Phenomena.
6. Apparatus and Technique.
7. Unclassified.

Cross-References:
Becquerel Effect, *see* Photoelectricity, 5.
Conductivity of Electrolytes, *see* Conduction (Electric) in Solids and Liquids, 9*b*.

Cross-References (contd.):
Electrocapillary Phenomena, *see* Surface Tension and Cohesion, 6.
Electrokinetic Phenomena, *see* Colloids, 2*b*.
Electrometallurgy, Electroplating and Electrotyping, *see* Section B.—Electrical Engineering.
Photovoltaic Cells, *see* Photoelectricity, 5.
Theories of Solution, *see* Solution, 1.
Thermodynamics of Cells, *see* Thermodynamics, 5 and 6.

1. Primary and Secondary Cells.

E.M.F. in Liquid Ammonia. G. I. Costeanu 740
Galvanic Cells Containing Potassium Triphenylmethyl. H. E. Bent and E. S. Gillfillan, Jr. 1617
Diffusion in Standard Cells. G. A. Hulett and R. B. Elliott 2030
Lead-Mercurous Acetate Voltaic Cell with Acetic Acid as Solvent. G. Tarbutton and W. C. Vosburgh 2031
E.M.F. of Cu-Hg Cell. (Miss) Quintin 2032

Electrochemistry, *continued.*

Abstract Nos.
Thermodynamic Properties of Fused Salt Solutions. Part VII. Zinc Bromide in Lead Bromide. E. J. Salstrom 2502
Temperature Coefficient of Cu-Hg Cell. (Miss) M. Quintin 2580
Temperature Coefficient of the Saturated Weston Cell. P. Vigoureux and S. Watts 2581
Rôle of Finely-Divided Mercury in the Depolariser of the Standard Cell. R. B. Elliott and G. A. Hulett 2582
Application of the Theory of Debye (Formula of Gronwall, La Merand Sandved) to Solutions of Cupric Sulphate. (Miss) M. Quintin 2583
Combustible Material Cells. E. Baur and J. Tobler 2584
Standard Battery. R. B. Elliott and G. A. Hulett 3186
Weston Standard Cells with Buffered Electrolytes. R. J. Priepke and W. C. Vosburgh 3787
See also 372, 749, 751, 1623, 2040, 2491, 2596, 3193, 3195, 3793, 4246 *under* 5; 3197, 5017 *under* 6.

2. Concentration Cells.

Ionisation of Organic Acids. H. M. Smallwood 368
Thermodynamics of Aqueous Hydrochloric Acid Solutions from E.M.F. Measurements. H. S. Harned and R. W. Ehlers 3707
Hall Effect and Resistance of Hydrogen-Charged Palladium-Silver and Palladium-Gold Alloys. J. Wortmann 5451
See also 2037, 4655 *under* 3; 751, 2491, 4659 *under* 5.

3. Electrolysis.

Solvent Influence on Solubility of Salts and Activity Coefficients of Ions. J. N. Brönsted, Agnes Delbanco and K. Volqvartz 109
Effect of Applied Voltage on Electrolysis in Residual Current Range. G. H. Damon 362
Photographic Study of the Growth of Electrolytic Striations. R. Taft and O. R. Bingham 364
Formation of Tantalum in Non-Aqueous Solutions. P. Schupp 365
Electrolytic Production of Sodium Persulphate. O. Essin and E. Alfimowa 366
Electrolysis of Fused Acetates and Propionates. G. B. Moorhouse 367
Exact Thermodynamics of Membrane Equilibria. F. G. Donnan and E. A. Guggenheim 665
Irreversible Processes in Electrolytes: Diffusion Conductance and Viscous Flow in Arbitrary Mixtures of Strong Electrolytes. L. Onsager and R. M. Fuoss 741
Electrolytes in Mixed Solvents. Part IV. Free Energy of Zinc Chloride in Water-Alcohol Solutions. R. T. Hamilton and J. A. V. Butler 742
Mechanical Stress in Electrolytic Copper Deposited in Presence of Colloids. P. Jacquet 743
Electrolysis of Nickel Salts in a Magnetic Field. H. Forestier 744
Activity Coefficients of Ions. K. Hass and K. Jellinek 745
Filtration of (Hydrophobic) Colloids. May Annetts 828
Influence of Anions on the Velocity of Solution of Zinc. E. Müller and J. Förster 897
Electrolysis of Dry Liquid Ammonia. R. Coustal and H. Spindler 1180
Association of Strong Electrolytes. J. Zirkler 1181
Activity Coefficients of Potassium Chloride. H. M. Spencer 1182
Zero Point Energy and Separation of Isotopes. H. Eyring 1257
Anodic Oxidation of Benzene. R. M. Archibald 1618
Qualitative Analysis by Means of Electrolysis and Spectrography. A. Schleicher 1619
Electrolytic Separation of Platinum. G. Grube and D. Beischer 1620
Properties of Electrolytic Solutions. Part II. Evaluations Λ_0 and of K for Incompletely Dissociated Electrolytes. Part III. Dissociation Constant. Part IV. Conductance Minimum and Formation of Triple Ions Due to the Action of Coulomb Forces. R. M. Fuoss and C. A. Kraus 2010, 2593, 3775
Electrochemical Oxidation of Anthraquinone. C. H. Rasch 2033
Electrochemical Oxidation of Napthalene. E. G. White 2034
Electrolytic Oxidation of Leuco-Bases of the Triphenylmethane Series. G. H. White, Jr. 2035

For the Key to this Index see pp. 1358 to 1372.

Electrochemistry, *continued*.

Abstract Nos.

Debye-Hückel Ion Size Parameter in Terms of Individual Ionic Radii. Activity Coefficient of Lead Chloride in Solutions of Cadmium Nitrate. H. D. Crockford and H. C. Thomas 2036

Dissociation Constant of Acetic Acid from 0° to 60° C. H. S. Harned and R. W. Ehlers 2037

Electrochemical Behaviour of Palladium. Part I. Deposition of Palladium and of Palladium-Silver Alloys from Complex Salt Solutions. G. Grube and D. Beischer 2585

Electrolysis of Fused Alkali Cyanides. M. Centnerszwer and J. Szper 2586

Theory of Discharge of Different Species of Ions. O. Essin 2587

Nernst Theory of the Association of Strong Electrolytes. J. Zirkler 2588

Interchange Between Metallic Atoms and More Noble Ions. Determination of the Absolute Surface of Metals and of the Active Surface of Noble Metals O. Erbacher 2589

Ionisation of Sulphuric Acid. H. M. Dawson 2590

Limiting Laws of the Interionic Attraction Theory of Strong Electrolytes. P. van Rysselberghe 2591

Boundary Layer of Dilute Electrolytes and the Diffusion Potential. Shu-Tsu Chang 2592

Short-Circuit Electrolysis. E. Manegold and R. Hofmann 3187

Electrochemical Phenomena in the Catalytic Decomposition of Hydrogen Peroxide by Platinum. R. Wolff 3188

Hydrogen Effect. H. v. Halban and G. Kortüm 3189

Activity Coefficients of Nitric Acid. F. Hartmann and P. Rosenfeld 3190

Conductivity and Potential Measurements with Salts of the Higher Alkyl Sulphonic Acids. A. Lottermoser and F. Püschel 3770

Properties of Electrolytes in the Solvent Sulphuric Acid. L. P. Hammett and A. J. Deyrup 3788

Extent of Dissociation of Zinc Sulphate. I. A. Cowperthwaite 3789

Electrophoretic Behaviour of Lecithin and Certain Fats. C. W. Price and W. C. M. Lewis 3887

Vapours of Reciprocal Pairs of Salts and Binary Mixtures. B. Greiner and K. Jellinek 4173

Vapour Pressures and Activities of Binary Metallic Alloys. E. Burmeister and K. Jellinek 4174

Electrolysis of Copper Salts of Organic Acids. G. Kravtzoff 4241

Electrolytes in Mixed Solvents. Part V. Free Energy of Lithium Chloride in Water-Alcohol Mixtures and Salting-out of Alcohol. J. A. V. Butler and D. W. Thomson 4242

Ionic Activity at Extremely High Concentrations. F. Tödt 4243

Thermodynamic Ionisation Constants of Carbonic Acid. D. A. MacInnes and D. Belcher 4244

Magnitudes of Electrolytically-Produced Gas Bubbles. B. Kabanow and S. Frumkin 4653

Kathode Generation of Hydrogen. J. Hoekstra 4654

Activity Coefficient of Potassium Chloride in Aqueous Solutions at 0° C. R. P. Smith 4655

Extent of Dissociation of Zinc Sulphate. C. W. Davies 5039

Activity Coefficients of Hydroxyl Ion in Solutions of Calcium Hydroxide at 30° C. E. P. Flint and L. S. Wells 5040

Isotopic Fractionation of Water. E. W. Washburn, E. R. Smith and M. Frandsen 5041

Theory of Concentrated Solutions of Strong Electrolytes. G. B. Bonino and G. Centola 5179

Glow Discharge Electrolysis. A. Klemenc and H. F. Hohn 5423

See also 1617, 2502 *under* 1; 3707 *under* 2; 363, 369, 2038 *under* 4; 373, 374, 746, 747, 748, 1187, 1188, 1189, 4248, 5047 *under* 5; 3159, 3282 *under* 6.

4. Ionic Mobilities and Transport Numbers.

Transference of Water. Part II. Its Dependence on Concentration and Temperature in the Electrolysis of Sodium Chloride Solutions G. Davies, N. J. Hassid and Millicent Taylor 363

Transport Number of Gold in a Gold Amalgam. K. Schwarz 369

Dielectric Constants of the Aqueous Solutions of Some Amino-Acids and Polypeptides. M. Frankenthal 1175

Electrochemistry, *continued.*

Abstract Nos.

Electrostatic Theory of the Frequency-Dependence of Ionic Mobilities and Dielectric Constants in Mixed Solutions of Strong Electrolytes. H. Falkenhagen and W. Fischer 1179, 4239
Measurement of the Velocity of Gold Micelles by Observation of the Moving Boundary. W. Hacker 1262
Conductivity of Aluminium Chloride in Non-Aqueous Solutions. E. Wertyporoch and T. Firla 1603
Electrophoretic Effect of the Concentration Effect. J. Schiele 1621
Conductivity of Nitric and Perchloric Acids and Mobility of the Hydrogen Ion. M. Hlasko and W. Klimowski 2009
Electrolytic Transport of Water in Sodium Iodide Solutions. G. Baborovský and A. Wagner 2038
Conductivity Measurements in Nitro-Compounds. Part III. Behaviour of Electrolytes in Nitro-Compounds. P. Walden and E. J. Birr 2561
Transport Numbers in Mixed Aqueous Solutions of Alkali Chlorides. Part I. P. van Rysselberghe. Part II. P. van Rysselberghe and L. Nutting 2594, 2595
Dielectric Constants of Aqueous Solutions of Amino-Acids and Polypeptides. M. Frankenthal 3181
Moving Boundary Method for the Determination of Transport Numbers. G. S. Hartley and J. L. Moilliet 3191
Ludwig-Soret Effect and Ionic Mobility in CuBr-AgBr Mixed Crystals. H. Reinhold and R. Schulz 3192
Diffusion and Electrolytic Conduction in Crystals (Ionic Semiconductors). W. Jost 3762
Electrical Conductivity of Aqueous Solutions of the Alkali Metal Hydroxides. J. Goworecka and M. Hlasko 3768
Theory of Electrolysis Phenomena in Metallic Solutions K. Schwarz 3790
Electrolytic Fraction of the Conductivity of Amalgams and Other Alloys. Part II. C. Wagner 3791
Electrical Conductivity of Capillary and Colloidal Systems. J. J. Bikerman 3884
Theory of Water and Ionic Solution, with Particular Reference to $\dot{H}$ and OH′ Ions. J. D. Bernal and R. H. Fowler 3951
Boundary Layer of Dilute Electrolytes. M. Planck 4245
Transportation Heats in Electrolytic Peltier Heats. E. Lange and T. Hesse 4300
Electrical Conductivity and Diffusion in Non-Metallic Solids. C. Tubandt 4633
Conductivity of Electrolytic Solutions in Strong Fields and at High Frequencies. P. Debye 4635
Conductivity in Solvents Having Very Small Dielectric Constants. R. M. Fuoss 4636
Internal Mobility of Solids. G. v. Hevesy 4656
Transport of Material and Passage of Current in Liquid Alloys. K. Schwarz 4657
Electroendosmosis and Electrolytic Water-Transport. Part III. Solutions of Copper Salts. H. C. Hepburn 5043
See also 2587, 2592 *under* 3.

5. Electrode Potentials and Electrode Phenomena.

Preparation and Reproducibility of the Quinhydrone Electrode. J. L. R. Morgan, Olive M. Lammert and Margaret A. Campbell 370
Iron as a Hydrogen Electrode. E. Liebreich 371
Influence of Gases on the Normal Potential of the Zinc Electrode. F. H. Getman 372
Deposition Potential of Mercury on Metallic Electrodes. T. Erdey-Grúz and H. Wick 373
Electrode Potentials and Chemical Reactivity. L. Kahlenberg 374
Anodic Behaviour of Nickel. Part II. K. Georgi 375
Anodic Film of Aluminium. Parts I and II. S. Setoh and A. Miyata 746
Fully Organised Anodic Layers on Aluminium. J. E. Lilienfeld, L. W. Appleton, W. M. Smith and J. K. Nieh 747
Overvoltage of Hydrogen. T. Erdey-Grúz and H. Wick 748
Hydrogen Overvoltage on Mercury Electrodes in Presence of Platinum. I. Šlendyk and P. Herasymenko 749
Mercury Drop Electrode. M. Andauer and E. Lange 750
Theory of Concentrated Solutions. Part V. E. Wilke and W. Schränkler 751
Standard Potential and Heat of Dissolution of Gallium. E. S. v. Bergkampf 752
Electromotive Behaviour of Nickel and Cobalt. E. Müller and J. Janitzki 1183

Electrochemistry, *continued.*

Abstract Nos.
Hydrogen Electrode in Chromic-Chromous Solutions. Solubility Product of Chromous Hydroxide. W. H. Bennett 1184
Improvements in the Hydrogen Electrode Used for Determining pH. P. L. du Noüy 1185
Unique Electrode Potential Characteristic of a Metal, and a Theory for the Mechanism of Electrode Potential. A. L. McAulay and E. C. R. Spooner 1186
Electrolytic Polarisation. Part X. Ammines of Copper, Silver, Zinc and Cadmium. S. Glasstone 1187
A.C. Capacities of Electrolytic Condensers. F. W. Godsey, Jr. 1188
Potential Gradients in Anodic Films. F. W. Godsey, Jr. 1189
Potentiometric Titration Method for Fluorine. N. Allen and N. H. Furman 1622
Influence of Acid Concentration on the Oxidation-Reduction Potential of Mixtures of Ferric and Ferrous Sulphates in Sulphuric Acid Solution. T. J. Glover 1623
Stick Antimony Electrode for Hydrogen-Ion Determinations. T. Uemura and H. Sueda 2039
Electrochemical Investigation of Cadmium-Silver Alloys. A. Ölander 2040
Kinetics of Electrode Processes. Part II. Reversible Reduction and Oxidation. J. A. V. Butler and G. Armstrong 2041
Influence of H.F. Currents on Polarised Electrodes. Part II. S. Glasstone and G. D. Reynolds 2042
Initial Electrolytic Overvoltage of the Disengagement of Hydrogen on Mercury. R. Dufour 2043
Heat of Dilution and Heat Capacity of Zinc Sulphate from the E.M.F. of Galvanic Cells. V. K. LaMer and I. A. Cowperthwaite 2491
Hydrogen-Oxygen Cells. J. Tobler 2596
Stirring and Grain Electrodes. E. Baur 2597
Hydrogen Overvoltage and Structure of the Double Layer. A. Frumkin 2598
Mechanism of the Hydrogen-Oxygen Electrode. K. Bennewitz and W. Neumann 3193
Occlusion of Hydrogen by Iron. F. Körber and H. Ploum 3194
Use of Tungsten-Nickel Electrode System in Neutralisations. N. H. Furman and G. W. Low 3195
Electrochemical Properties of Photosensitive Electrodes in Copper Salts. R. Audubert 3196
Anodic Behaviour of Cobalt. K. Georgi 3792
Anode Reactions in the Lead Accumulator. E. H. Riesenfeld and H. Sass 3793
Electrochemical Investigation of Brass. A. Ölander 3794
Application of Compensated Valve-Voltmeter to Measurements of Glass Electrode Potentials. A. S. McFarlane 3795
Influence of the Hydrogen-Ion Concentration on the Light Sensitivity of Gelatin-Free Silver Bromide. A. J. Rabinowitsch and C. S. Bagdassarjan 4059
P.D. between Copper and its Amalgam, and Reproducibility of the Copper Electrode. M. Oku 4246
Mechanism of Action of Light on Electrodes Photosensitised by Copper Salts. R. Audubert 4247
Mechanism of Hydrogen Overvoltage and the Electrolytic Oxidation of Hydrogen. L. P. Hammett 4248
Constitution of Anodically Formed Ta_2O_5 Layers. P. O. Schupp 4658
Junction Potentials between Glass and Salts in Fusion. H. B. Elkins and G. S. Forbes 4659
Theory of Overvoltage. O. Essin 5042
Single Potential of Aluminium. H. Endô and S. Kanazawa 5044
Silver-Silver Iodate Electrode. J. N. Pearce and V. I. Wirth 5045
Polarisation Currents Due Solely to Changes in Electrode Area. K. E. Glidden and W. A. Patrick 5046
Formation of Tantalum in Non-Aqueous Solvents. P. O. Schupp 5047
Anodic Behaviour of Nickel. Part III. K. Georgi 5048
Anodic Behaviour of Iron. K. Georgi 5049
Interchange between the Atoms and Ions of a Metal. O. Erbacher 5050
Ionic Adsorption at Metals and Charcoal. A. Frumkin 5099
Properties of the Double Layer and the Exchange Adsorption of Ions at Non-Metallic Surfaces. B. P. Nikolski 5100
Dependence of the Volta Potential of the Systems Ag/Ag (soln.) and Cu/Cu (soln.) upon Concentration. M. Andauer and E. Lange 5424

For the **Key** to this Index see pp. 1358 to 1372.

Electrochemistry, *continued.*

Abstract Nos.

Dependence of Minimum Voltage of Electrolytic Valve Action on Defining Variables. O. Mohr 5425
Mercury Drop Electrode. E. Lange 5426
Electrodes of the Third Species. M. le Blanc and O. Harnapp 5427
Mechanism of the Oxygen Electrode. T. P. Hoar 5428
Phenomena in the Movement of an Electrode in an Electrolyte and Electrolytic Potential. M. O. Charmadarjan and B. I. Perwuschin 5429
Overvoltage. M. Volmer 5430
Quantum Mechanics and Overvoltage. R. W. Gurney 5431
Electrolytic Cleaning of Metals. B. Kabanow 5432
See also 2031, 2502, 2582 *under* 1 ; 364, 365, 366, 1618, 2587, 2592, 3188, 5040 *under* 3 ; 376, 1624, 1625, 2350, 3796, 3797 *under* 6.

6. Apparatus and Technique.

Measurement of Overvoltage. A. L. Ferguson and G. M. Chen 376
Thermodynamic Properties of Fused Salt Solutions. E. J. Salstrom 662
Valve Potentiometer with Glass Electrodes. F. Rosebury 753
Modified Electro Ultra-Filter. D. v. Klobusitzky 839
Improved Conductivity Cell. B. Moore 1172
Modified Circuit for Routine Use of the Glass Electrode. E. C. Gilbert and A. Cobb 1624
Metal-Connected Glass Electrode. M. R. Thompson 1625
A. Ångström's Total Immersion Hydrometer. P. F. Gaehr. 2159
Duboscq Instrument for Colorimetry, Nephelometry and Colorimetric Determination of Hydrogen-Ion Concentrations. J. Grant and J. H. W. Booth 2350
Practical Valve Circuit for the Measurement of E.M.F. S. B. Ellis and S. J. Kiehl 2599
Valve-Voltmeter for Measurements of Hydrogen-Ion Concentration. A. S. McFarlane 3159
New Silver Voltameter. M. Picard and A. Stampa 3197
Concentration of H^2 Isotope. G. N. Lewis and R. T. Macdonald 3282
Durable Glass Electrode. D. A. MacInnes and D. Belcher 3796
Use of Bimetallic Anodes in the Electrolytic Synthesis of Alloys. C. Béchard .. 3797
Use of Valve Electrometer with Extremely High Input Resistance. R. E. Burroughs and J. A. Ferguson 4217
Standard-Cell Comparator. H. B. Brooks 5017
See also 1182, 3187, 4653 *under* 3 ; 370, 3195 *under* 5.

7. Unclassified.

Quantum Mechanics and Chemistry with Particular Reference to Reactions Involving Conjugate Double Bonds. H. Eyring 1958
Acid Strength and its Dependence on the Nature of the Solvent. W. F. K. Wynne-Jones 3201
Properties of Gelatin in the Electric Field. Suzanne Veil 4316
Absorption in the Far Ultra-Violet of Aqueous Solutions of Hydrochloric Acid. R. Tréhin 4918

Electro-Optical and Magneto-Optical Effects.

1. Double Refraction in Electric or Magnetic Fields.
2. Magnetic Rotation of Plane of Polarisation.
3. Unclassified.

Cross-References :

Photoelasticity, *see* Elasticity and Plasticity, 5.
Photoelectric Effect, *see* Photoelectricity.
Photophoresis, Effect of Electric or Magnetic Fields, *see* Radiation, Mechanical Effects, 2.
Stark Effect, *see* Spectroscopy, 7.
Zeeman Effect, *see* Spectroscopy, 6.

1. Double Refraction in Electric or Magnetic Fields.

Spectra Emitted during the Early Stages of a Condensed Discharge through Nitrogen at Low Pressure. H. Hamada 1051
Relationship between Anisotropy of the Optical Polarisability and the Geometrical Structure of a Molecule. H. A. Stuart and H. Volkmann 1426
Molecular Theory of Simultaneous Optical Effects of Magnetic Rotatory Polarisation and Magnetic Birefringence. G. Dupouy and M. Schérer 1847

Electro-Optical and Magneto-Optical Effects, *continued.*

Abstract Nos.

Wave-Surface in a Liquid under the Influence of a Magnetic Field. A. Cotton 1848

Transversal Magneto-Optical Anisotropy of Vanadium Pentoxide Sols. W. Heller and H. Zocher 2351

Anomalous Dispersion of Magnetic and Electric Double Refraction. R. Lucas and M. Schwob 2352

Electrical Breakdown in Liquids by Means of the Electro-Optical Shutter. H. W. Washburn 2576

Distortion in Kerr Cell. E. E. Wright 2943

Kerr's Law at High Field Strengths. J. A. Hootman 2944

Calculation of Statistical Averages for Perturbed Systems. R. Serber........ 3343

Dispersion of Electric Birefringence of Ethyl Ether. M. Schwob 3481

Theory of the Kerr Effect of Diatomic Molecules. T. Neugebauer........ 3482

Molecular Orientation of Molecules with Permanent Moment in an Alternating Field. Application of the Dispersion of the Dielectric Constant and the Kerr Effect. Y. Rocard 3483

Theory of Depolarisation, Optical Anisotropy and the Kerr Effect. R. Serber 3484

Magnetic Birefringence in Liquid Mixtures. S. W. Chinchalkar 3485

Magnetic Birefringence of Cerium Salts in Aqueous and Non-Aqueous Solutions. C. Haenny 3486

Magnetic Double Refraction of Liquid Oxygen. P. Lainé 3487

Temperature Variation of Magnetic Double Refraction of Liquid Oxygen. P. Lainé 3488

Paramagnetism and Magnetic Birefringence of Oxygen Gas and Liquid. L. Goldstein and Y. Rocard 3489

Thermal Variation of Abnormal Magnetic Birefringence. R. Lucas........ 3490

Kerr Effect and Association in Liquids. H. A. Stuart and H. Volkmann...... 4048

Abnormal Electric and Magnetic Birefringence. R. Lucas and M. Schwob.... 4049

Kerr Effect with Isomeric Benzene Derivatives. G. Otterbein 4457

Dispersion of the Kerr Electro-Optic Effect in the Short Infra-Red Spectrum. L. R. Ingersoll and W. R. Winch 4458

Optical Anisotropy of Molecular Crystals. Part I. Experimental. S. B. Hendricks and M. E. Jefferson........ 4487

Electric Birefringence of Camphor. M. Schwob 4868

Electro-Optical Kerr Effect in Gases. C. W. Bruce 5264

Kerr Effect in Gases and Vapours at Higher Temperatures. H. A. Stuart and H. Volkmann 5265

Cotton-Mouton Constant of Nitrobenzene at the Transition Point. H. König.. 5266

See also 4869, 4871 *under* 2.

2. Magnetic Rotation of Plane of Polarisation.

Magneto-Optic Rotation by Condenser Discharge. F. G. Slack and W. M. Breazeale 182

Anomalous Circular Magnetic Dichroism and Rotatory Dispersion of $CoCl_2$ Solutions. A. Cotton 561

Anomalous Circular Magnetic Dichroism and Rotatory Dispersion of $CoCl_2$ Solutions. M. Schérer 562

Mixture Rule for the Electromagnetic Rotation of the Plane of Polarisation. O. Schönrock 563

Faraday Effect of Electrolytes in Aqueous Solutions. E. B. Andersen and R. W. Asmussen 564

Lead Isotopes. Edna R. Bishop, Margaret Lawrenz and C. B. Dollins........ 1253

Bismuth Isotopes. F. Allison and Edna R. Bishop........ 1254

Radium Isotopes. Edna R. Bishop and C. B. Dollins........ 1255

Isotopes of Uranium, Thorium and Thallium. R. Goslin and F. Allison 1256

Rotatory Magnetic Dispersion of a Diamagnetic Coloured Compound. Thiobenzophenone. A. Cotton and M. Schérer........ 1427

Magnetic Rotatory Power of Chlorine and of Gaseous Hydrogen Chloride. R. de Mallemann and P. Gabiano........ 1428

Paramagnetic Properties of Crystals of the Rare Earths. H. A. Kramers 1849

Faraday Effect in Paramagnetic Solutions. C. J. Gorter 2353

Faraday Effect in a Camphor Derivative. J. Verhaeghe........ 2354

Magneto-Optical Dispersion of Organic Liquids in the Ultra-Violet. Part V. Normal Propyl Propionate, Isobutyl Acetate, Ethyl Acetoacetate and Ethyl Oxalate. A. de M. Beanland and E. J. Evans 3491

Magneto-Optical Dispersion of Acetic Acid and Normal Propyl Acetate. W. J. Lewis and G. E. Jones 3492

Electro-Optical and Magneto-Optical Effects, *continued*.

Abstract Nos.

Magnetic Circular Dichroism of Aqueous Solutions of Cobalt Sulphate and Nitrate. M. Schérer and R. Cordonnier ... 3493
Magnetic Rotatory Power of Gases and Vapours. P. Gabiano ... 4050
Isotopes of Cobalt by the Magneto-Optic Method. T. R. Ball and S. S. Cooper ... 4306
Magneto-Optical Rotation of Nickel. K. H. v. Klitzing ... 4869
Absence of Inertia in the Dia-Magnetic Faraday Effect. W. Hanle ... 4870
Time Lags in the Faraday Effect. J. S. Webb and D. R. Morey ... 4871
Paramagnetic Faraday Effect in Alums. H. Kaufmann ... 5268
Paramagnetic Properties of Crystals of the Rare Earths. Part II. H. A. Kramers ... 5461
See also 1847, 1848 *under* 1.

3. Unclassified.

Quenching of Iodine Fluorescence by Magnetic Fields and Foreign Gases. W. Berg ... 567
Change of Reflectivity of Bismuth due to Magnetisation. E. Englert and K. Schuster ... 584
New Photomagnetic Effect. D. M. Bose and P. K. Raha ... 1429
Nature of the Absorption Centres in Crystals and Solutions Containing Paramagnetic Ions. Mechanism of the Absorption. D. M. Bose and S. Datta ... 1430
Hyperfine Structure and Polarisation of Resonance Radiation. Part II. Magnetic Depolarisation and Determination of Mean Lives. A. C. G. Mitchell ... 3557
Effect of the Magnetic Field on the Fluorescence of a Stream of Cadmium Atoms: Lande Factor *g* for State 2^3P_1. P. Soleillet ... 4053
Quenching of Tellurium Vapour Fluorescence by Magnetic Fields. R. Smoluchowski ... 4873

Electrons, Positrons and Protons.

1. Constitution.
2. Magnitudes (Charge, Mass, Magnetic Moments, etc.).
3. Collision; Diffraction, Scattering, Reflection, Absorption.
4. Diffusion.
5. Waves.
6. Unclassified.

Cross-References:
Conduction of Electricity in Metals, *see* Conduction (Electric) in Solids and Liquids, 1.
Conduction of Heat in Metals, *see* Conduction (Thermal), 1.

Cross-References (contd.):
Excitation Potentials, *see* Conduction (Electric) and Discharge in Gases, 5.
Kathode Rays, *see also* Conduction (Electric) and Discharge in Gases, 9.
Neutrons, *see* Atomic and Molecular Structure, 4.
Thermoelectric Effects in Metals, *see* Thermoelectricity, 1.
See also Atomic and Molecular Structure, *also* Radioactivity.

1. Constitution.

Equivalence of Corpuscular and Wave Interpretations of Negative Electricity in Quantum Theory. R. Einaudi ... 89
Quantum Mechanics. P. Ehrenfest ... 96
Electrons as Cosmic Rays. W. F. G. Swann ... 579
Some Inquiries Concerning Quantum Mechanics. W. Pauli ... 1757
Positive Electron. C. D. Anderson ... 2337
New Evidence for the Positive Electron. J. Chadwick, P. M. S. Blackett and G. P. S. Occhialini ... 2338
Photographs of the Tracks of Penetrating Radiation. P. M. S. Blackett and G. P. S. Occhialini ... 2382
Acquirement of Cosmic-Ray Energies by Electrons. W. F. G. Swann ... 2383
Gravitation and Earth's Magnetism. T. Schlomka ... 2911
Positive Electrons. Irène Curie and F. Joliot ... 2919
Electromagnetic Field of a Moving Electrified Sphere and its Radiationless Orbits. G. A. Schott ... 3222
Interatomic Electrons in Crystal Lattices. R. Forrer ... 3229
Protons and Positive Electrons. H. Mandel ... 3472
Origin of Positive Electrons. Irène Curie and F. Joliot ... 3473
Has the Negative Energy Spectrum an Influence on Nucleus Phenomena? G. Beck ... 3938

Electrons, Positrons and Protons, *continued.*

Abstract Nos.
Emission of Positive Electrons by γ-Radiation of Ra (B + C). Grinberg .. 4448
Constitution of Neutrons, Positive Electrons and Photons. Existence of Negative Protons. J. J. Placinteanu 4855
Neutrons and Positive Electrons. R. Fürth 4857
Possibility of Emission of Positive Electrons from the Nucleus of γ-Rays. A. Bramley 5251
Physical Properties of the Positron. J. Thibaud 5252
Electrons Produced by Artificial Disintegration. Irène Curie and F. Joliot .. 5253

2. Magnitudes (Charge, Mass, Magnetic Moments, etc.).

Theory of Electric Charge. A. S. Eddington 92
Nuclear Spin and Magnetic Moment of Li^7. L. P. Granath 236
Measurements of the Charge on Selenium Particles at High Gas Pressures. E. Wasser 377
Most Probable Values of *e*, *e/m* and *h*. K. Shiba 378
Magnetic Moment and Moment of Rotation of the Electron. L. de Broglie 379
Electrons as Cosmic Rays. W. F. G. Swann 579
e/m Measurements of Filament Rays. K. Siebertz 711
Kaufmann-Bucherer Experiments and a Classical Einsteinian Mass Formula. A. Press 754
Vaporisation Phenomena in Mercury Particles. A. Lustig and M. Reiss 1190
Resistance of Small Spheres in Motion through Air. G. Mönch 1322
Charge on Selenium Particles at High Gas Pressures. F. Ehrenhaft 1627
Theory of Electron Spin. S. Shimasaki 1747
Most Probable Values of the Atomic Constants *e* and *h*. R. Ladenburg 2044
Determination of *e/m* for an Electron by a New Deflection Method. F. G. Dunnington 2600
Determination of *e/m* by Means of Photoelectrons Excited by X-Rays. G. G. Kretschmar 2601
Vaporisation Phenomena for Mercury Particles. R. Nestle, K. Schäfer and E. Regener 3202
Instrument for Converting Voltage Values into Hρ Values for Electrons. J. V. Hughes 3203
Magneto-Optical Dispersion of Organic Liquids in the Ultra-Violet. Part V. Normal Propyl Propionate, Isobutyl Acetate, Ethyl Acetoacetate and Ethyl Oxalate. A. de M. Beanland and E. J. Evans 3491
Magneto-Optical Dispersion of Acetic Acid and Normal Propyl Acetate. W. J. Lewis and G. E. Jones 3492
Possible Common Cause for Sub-Electronic Charge and Electrophotophoresis. K. Sitte 4075
Most Probable Values of *e*, *e/m* and *h*. K. Shiba 4250
Determinations of the Charge on Small Test Particles. A. Lustig and M. Reiss 4251
Electrostatic Deviation of Positive Electrons. J. Thibaud 4449
Wilson Chamber as a Counting Apparatus for α- and H-Rays. R. Trattner 5015
See also 2337, 2338, 2382, 2911 *under* 1.

3. Collision; Diffraction, Scattering, Reflection, Absorption.

Ionising Power of Artificial H-Rays. K. Diebner 171
Inelastic Electron Scattering in Gases. C. B. O. Mohr and F. H. Nicoll 380, 5053, 5437
Scattering of Slow Electrons. E. Feenberg 381
Reflection of Fast Electrons from Single Crystals. H. Raether 382
Passage of Neutrons through Matter. H. S. W. Massey 556
Magnetic Spectrum of Ultra-Penetrating Radiation. P. Kunze 581
Association in Gases under the Effect of Electric Fields. H. Senftleben 644
Loss of Energy of Slow Positive Rays in their Passage through Matter. W. Reusse 708
Magnetic Spectra of Secondary Electrons from Silver. S. Chylinski 755
Large Angle Scattering of Electrons in Gases. Part II. C. B. O. Mohr and F. H. Nicoll 756
Inelastic Collisions of Fast Electrons. O. Klemperer 757
Quantum Theory of the Diffusion of Electrons. L. Goldstein 758

For the **Key** to this Index see pp. 1358 to 1372.

Electrons, Positrons and Protons, *continued.*

Abstract Nos.

Conservation of Momentum in the Processes of Electronic Impacts. L. Goldstein 759
Diffraction of Fast Protons by Gold Foil. E. Rupp 760
Diffraction Experiments with Slow Electrons. A. Bühl 761
Particle Size Determination by Electron Diffraction. M. v. Laue 856
Behaviour of Electrons in Nitrous Oxide. V. A. Bailey and J. B. Rudd 1160
Electron Interference and Röntgen Interference. F. Kirchner 1191
Polarisation of Electrons after Double Scattering at 90°. E. Rupp 1192
Recent Experiments on the Polarisation of Electrons. E. Rupp 1193
Influence of Angular Distribution of Scattered Electrons on the Measurement of the Effective Cross-Section. R. Kollath 1194
Effective Cross-Sections of Molecules According to the Kinetic Gas Theory. Part II. H. E. Binkele 1321
Theory of X-Ray Absorption in Molecular Gases. Part II. H. Petersen 1527
Effective Cross-Sections of Atoms with Respect to Slow and Fast Electrons. R. L. Rosenberg 1628
Energy Exchanges in Corpuscular Collisions. R. Döpel 1629
Electron Scattering in Helium. Absolute Measurements at 90° and 45°. S. Werner 1630
Collision of Slow Electrons with Atoms. Part II. General Theory and Inelastic Collisions. Part III. Excitation and Ionisation of Helium by Electrons of Moderate Velocity. H. S. W. Massey and C. B. O. Mohr 1631, 3800
Velocity Distribution of the Secondary Electrons Liberated from Insulators. G. Kalckhoff 1632
Electron Diffraction by Amorphous Carbon. C. Mongan 1633
Diffraction of Kathode Rays by Single Crystals. Part III. Simultaneous Reflection. K. Shinohara 1634
Photoelectric Currents in Gases between Parallel Plate Electrodes. L. A. Young and N. E. Bradbury 1656
Magnetic Deflection of Cosmic Corpuscles in the Wilson Chamber. P. Kunze 1873
Stopping Power of Matter for Swiftly Moving Charged Particles. F. Bloch 2045
Efficiency of Secondary Electron Emission. S. R. Rao 2046
Scattering of Similar Particles. T. Sexl 2047
Photographs of Electron Scattering by Finely Divided Crystalline Carbon. F. Trendelenburg 2048
Scattering of Electrons by Ions and the Mobility of Electrons in a Cæsium Discharge. C. Boeckner and F. L. Mohler 2532
Some Factors Affecting Cross-Section for Collisions of the Second Kind between Atoms and Ions. O. S. Duffendack and K. Thomson 2602
Elastic Scattering of Electrons by Mercury Atoms. E. B. Jordan and R. B. Brode 2603
Reflection and Secondary Radiation of Protons in Collisions with Solid Bodies. C. Ramsauer and R. Kollath 2604
Scattering of Slow Protons by Gas Molecules. C. Ramsauer and R. Kollath 2605
Stopping Power of Atoms with Several Electrons. F. Bloch 2606
Crystalline State of Thin Sputtered Films of Platinum. G. P. Thomson, N. Stuart and C. A. Murison 2696
Interaction between Neutrons and Protons. J. Solomon 2927
Collision between Neutrons and Protons. P. Auger and G. Monod-Herzen 2928
Origin of Cosmic Radiation. H. Alfvén 2991
Kathode Disintegration of Platinum by Mercury Ions. J. E. Henderson and Edith Gideon 3142
Reflection of Electrons from Standing Light Waves. P. L. Kapitza and P. A. M. Dirac 3204
Scattering of Electrons in Thin Films. G. O. Langstroth 3205
Energy of the Beams in Electron Diffraction. F. C. Poultney and R. Whiddington 3206
New Type of Apparatus for Experiments in Secondary Electron Diffraction. W. R. Sproull 3207
Diffraction of Low-Speed Electrons by a Tungsten Single Crystal. W. T. Sproull 3208
Diffraction of Electrons by Metal Surfaces. L. H. Germer 3209
Electron Diffraction in Gaseous SF_6, SeF_6 and TeF_6. H. Braune and S. Knoke 3210
Diffraction of Electrons in Mercury Vapour. Part II. F. L. Arnot 3211

Electrons, Positrons and Protons, *continued.*

Abstract Nos.

Diffraction of Kathode Rays by Mica. K. Shinohara and K. Matukawa.... 3212
Secondary Emission of Electrons from Molybdenum. P. L. Copeland...... 3269
Polish on Metals. R. C. French 3526
Detection of Impurities in Canal Rays by Electron Diffraction. H. Raether 3735
Scattering Experiments with Fast Protons. R. v. Meibom and E. Rupp.... 3798
Reflection of Kathode Rays at the Surface of a Single Crystal. S. Kikuchi and S. Nakagawa 3799
Elastic Electron Scattering in Neon. A. L. Hughes and J. H. McMillen.... 3801
Inelastic Electron Scattering by Helium Atoms. A. L. Hughes and J. H. McMillen 3802
Diffraction of Electrons Through Large Angles. R. v. Meibom and E. Rupp 3804
Fine Structure of Electron Diffraction Beams from a Gold Crystal and from a Silver Film on a Gold Crystal. H. E. Farnsworth........ 3805
Structure of Magnesium, Zinc and Aluminium Films. G. I. Finch and A. G. Quarrell 3895
Catalytic Properties and Structure of Metal Films. Part I. Sputtered Platinum. G. I. Finch, C. A. Murison, N. Stuart and G. P. Thomson.... 3896
X-Ray and Electron Diffraction of Iodine and the Diiodobenzenes. S. B. Hendricks, L. R. Maxwell, V. L. Mosley and M. E. Jefferson........ 3898
Four-Place Table of sin x/x. J. Sherman........ 3927
Scattering of Neutrons and Protons. E. Wigner........ 4041
Intensity of Scattered Radiation due to Moving Free Electrons. W. Pauli.... 4252
Intensity of Scattered Radiation of Bound Electrons. H. Casimir 4253
Scattering of Electrons by Atoms. J. Winter 4254
Electron Scattering by Heavy Atoms. W. Henneberg 4255
Scattering of Electrons by Metal Vapours. Part I. Cadmium. Part II. Zinc. E. C. Childs and H. S. W. Massey 4256, 5436
Electron Diffraction and Photoelectric Action of Alkali Metal Surfaces. W. Kluge and E. Rupp 4257
Electron Diffraction by Liquids. L. R. Maxwell 4258
Electron Diffraction and Molecular Structure. R. W. Dornte 4259
Interaction between Neutrons and Proton's. G. C. Wick 4452
Passage of Fast Corpuscles through Ferromagnetic Material. C. F. v. Weizsäcker 4481
X-Ray Line Intensities and Kathode-Ray Retardation in Thick Targets of Silver. D. L. Webster, W. W. Hansen and F. B. Duveneck 4556
Diffusion of Electrons and Distribution of Momenta. J. Winter 4660
Conditions for the Occurrence of the Ramsauer Effect. W. Voss 4661
Effect of Neutral Gas Molecules on Slow Protons. (Total Effect, Scattering, Transfer of Charge.) C. Ramsauer and R. Kollath 4662
Principles Underlying Cross-Section Measurements of Gas Molecules. H. L. Brose 4663
Effect of Exchange on the Scattering of Slow Electrons from Atoms. P. M. Morse and W. P. Allis........ 4664
Atomic Disintegration by Penetrating Radiation. J. Barnóthy 4849
Hoffmann Collisions and Barnóthy's Theory. E. G. Steinke 4850
Collisions of Neutrons with Protons. F. N. D. Kurie 4858
Excitation Probabilities of He, A and Ne at Zero Scattering Angle. J. E. Taylor and R. Whiddington 5006
Energy Losses of Slow Electrons in Nitrogen. G. W. Brindley 5007
Anomalous Reflection of Fast Electrons at the Surface of a Single Crystal. S. Kikuchi and S. Nakagawa 5051
Mott Polarisation Effect in the Scattering of Electrons by Atoms. F. Sauter.. 5052
Diffraction of Fast Electrons by Single Crystal of Brucite. G. Aminoff 5054
Diffraction of Slow Electrons by a Single Tungsten Crystal. R. v. Meibom and E. Rupp 5055
Electron Diffraction Patterns from Platinised Asbestos. D. A. Richards...... 5056
Shape of an Electron Beam in a Magnetic Field. N. F. Barber 5057
Inner Potential of Metals. J. A. Darbyshire........ 5058
Electron Diffraction and Molecular Structure: Carbonyl Compounds. R. W. Dornte 5106
Scattering of Slow Electrons by Single Crystals of Graphite. W. E. Laschkarew, E. W. Bärengarten and G. A. Kuzmin........ 5434
Scattering of Electrons by Nitrogen Molecules. H. S. W. Massey and E. C. Bullard 5435
Diffraction of Fast Electrons. M. Kosman and A. Alichanian 5438

For the Key to this Index see pp. 1358 to 1372.

Electrons, Positrons and Protons, *continued*.

Abstract Nos.

Position of the Hydrogen Ions in the NH_4Cl Crystal Determined by Electron Diffraction. W. E. Laschkarew and I. D. Usyskin 5439
Electron Interference at Mechanically Worked Surfaces. H. Raether 5440
Electron-Diffraction Investigation of the Structure of Molecules of Methyl Azide and Carbon Suboxide. L. O. Brockway and L. Pauling 5441
Electron-Diffraction Investigation of the Molecular Structure of Cyanogen and Diacetylene, with a Note on Chlorine Dioxide. L. O. Brockway 5442
Electron Diffraction by Hydrocarbons. H. R. Nelson 5443
Structure of Thin Celluloid Films. Part I. E. T. Jones 5444
Inner Potential of Semi-Conductors. K. R. Dixit 5445
Polarisation of Electrons by Reflection. T. Förster 5446
See also 2382 *under* 1; 3803, 5433 *under* 4.

4. Diffusion.

Electron Diffusion, Electron Attachment and Ageing of Negative Ions in Commercial Nitrogen at Atmospheric Pressure. J. Zeleny 693
Velocity Distribution among Electrons in the Positive Column. M. J. Druyvesteyn 702
Energy Distribution of Diffusing Slow Electrons. M. Didlaukis 3803
Distribution of Energies of Electrons in Gases. J. S. Townsend 5433
See also 758, 759, 3206, 3207, 3208, 4481 *under* 3.

5. Waves.

Movement of Charged Particles in a Field of Suddenly Changing Potential. E. Persico 1195
Theory of Geometric Optics for Electrons. J. Picht 1196
Mechanical Theory of Wave Mechanics and Quantum Mechanics. A. Korn 1754
Foundations of the Electron Wave Equation. S. R. Milner 1755
Determination of the Structures of the Hexafluorides of Sulphur, Selenium and Tellurium by the Electron Diffraction Method. L. O. Brockway and L. Pauling 2108
Atomic Disintegration by Proton Bombardment (Canal Rays). F. Kirchner 3476
Geometrical Optics in Inhomogeneous Media. J. Picht 3527
Extension to Wave-Mechanical Theory. R. Zaycoff 3932
Optical Imagery. J. Picht 4078
Determination of the Structures of Methane Derivatives by the Electron Diffraction Method. R. W. Dornte 4308
Extension to Wave-Mechanical Theory. R. Zaycoff 4375
Models of the Electric Field and of the Photon. J. J. Thomson 5462
See also 5445 *under* 3.

6. Unclassified.

Cooperative Phenomena. F. Zwicky 1700
Mechanism of Acquirement of Cosmic-Ray Energies by Electrons. W. F. G. Swann 1872
Photographic Detection of Protons Liberated by Neutrons. Part II. Marietta Blau and Hertha Wambacher 2333

Electrostatics.

1. Theory.
2. Frictional Electricity.
3. Contact Potential.
4. Apparatus.
5. Unclassified.

Cross-References:
Capacitance, *see* Dielectrics and Capacitance, 7.
Dielectric Constants, *see* Dielectrics and Capacitance, 2.
Electrode Potentials, *see* Electrochemistry, 5.
Units, *see* Mathematical Methods, etc., 3.

1. Theory.

Electrostatic Theory of the Frequency-Dependence of Ionic Mobilities and Dielectric Constants in Mixed Solutions of Strong Electrolytes. H. Falkenhagen and W. Fischer 1179, 4239
Field Due to Two Equally Charged Parallel Conducting Cylinders. H. Poritsky 1197

Electrostatics, *continued*.

Abstract Nos.

Inverted Prolate Spheroids. (Miss) D. M. Wrinch 1198
Many-Valued Potential Functions. R. Wavre 2207
Action at a Distance in Electricity. H. Abraham 3213
New Statistics and Electrostatics. M. K. Gopalaiengar 3806
Electrostatic Theory of the Plasma. D. Gábor 4610

2. Frictional Electricity.

Frictional Electricity. E. Hess 383
Attractions between Resin and Mercury. K. Nakata 1199
Triboelectricity and Friction. Part VII. Quantitative Results for Metals and Other Solid Elements, with Silica. P. E. Shaw and E. W. L. Leavey 1200
Electric Charge Collected by Water Drops Falling through Ionised Air in a Vertical Electric Field. J. P. Gott 4837
Electrostatic Properties of Photographic Films. D. C. Rose 4888

3. Contact Potential.

Thermodynamic Analysis of Electromotive Forces. J. Villey 1635
Contact Potential of Zinc Crystals. W. A. Zisman and H. G. Yamins 2049
Thermoelectric and Volta Potentials of Cuprous Oxide. G. Mönch and S. Stechhöfer 4299
Electrical Properties of Monomolecular Films on Liquids. H. G. Yamins and W. A. Zisman 4380
Contact Potential Differences between Different Faces of Copper Single Crystals. H. E. Farnsworth and B. A. Rose 4665
Contact P.D. Between Different Faces of Copper Single Crystals. B. A. Rose 5059
Influence of Contact Potential on Electrometer Measurements. E. Rumpf.... 5447
Work Function and Photoelectric Properties of Metals. P. I. Lukirsky 5489
See also 1200 *under* 2.

4. Apparatus.

Self-Recording Cosmic-Ray Electrometer and Depth-Ionisation Curve. J. M. Benade 214
H.T. D.C. Generator. R. E. Vollrath 384
Space Charge in Relation to the Chemical Constituents of the Atmosphere. R. Stoppel 547
Migration of Dust Particles in Electric Filters. G. Mierdel 762
Spherical Particles in an Ionised Field. M. Pauthenier and (Mme.) M. Moreau-Hanot 1636
Sensitivity-Control for the Lindemann Electrometer. L. G. Grimmett 1637
Quantitative Theory of the Wimshurst Static Machine. A. W. Simon 2050
Quantitative Theory of the Toepler-Holtz Static Machine. A. W. Simon 2051
Electrostatic Production of High Voltage for Nuclear Investigations. R. J. van de Graaff, K. T. Compton and L. C. van Atta 2052
Ultra-Sensitive H.T. Electrostatic Indicating Voltmeter. W. R. Harper...... 2053
3000-kV Impulse Generator. T. E. Allibone, F. S. Edwards and D. B. McKenzie 2076
Switch for Electrometer. F. Bayer 2607
Capacity of Electrometers. H. Benndorf 3214
Sources of Error in Capacity Measurements with Sensitive Electrometers. E. Sienkiewicz 3215
H.T. Electrostatic Induction-Electrometer. A. Hinzpeter 3217
Corona Currents in Electro-Filters. W. Deutsch 3729
H.T. Constant D.C. Generator. N. Mortara 3752
Impulse Generator Operating at Three Million Volts. d'Arsonval 3753
Electrostatic H.T. Voltmeter. G. S. Field 3754
Use of Valve Electrometer with Extremely High Input Resistance. R. E. Burroughs and J. A. Ferguson 4217
Improved Balanced Circuit for Use with Electrometer Tubes. L. A. Turner and C. O. Siegelin 4223
Influence of Field Strength and of the Time the Gases are in Electro-Filters upon the Degree of Purification. S. Kalaschnikow 4260
Capacity of Dolezalek Electrometers. G. Nadjakoff 5060
Extension of Limits of Application of the Duant Vacuum Electrometer. K. Diebner 5061
Effective Capacity of the Lindemann Electrometer. J. J. McHenry 5062

Electrostatics, *continued.*

Abstract Nos.

Braun Electrometer with Strip Suspension. A. Wehnelt and J. Johannesson 5063

Electrostatic Generating Voltmeter. G. P. Harnwell and S. N. van Voorhis 5064

Electrostatic Machine. P. Jolivet 5448

Gold-Leaf Electroscope. J. Back 5449

See also 2049, 4380, 5447 *under* 3.

5. Unclassified.

Applications of Prolate Spheroidal Harmonics. D. M. Wrinch 470

Vaporisation Phenomena in Mercury Particles. A. Lustig and M. Reiss 1190

Effect of High Electrostatic Fields upon the Vaporisation of Molybdenum. G. B. Estabrook 1939

Inner Potential of Metals. J. A. Darbyshire 5058

Fluorescence and Phosphorescence. Luminescence and Afterglow.

1. Fluorescence.
2. Phosphorescence.
3. Luminescence and Afterglow.
4. Apparatus and Instruments.
5. Unclassified.

Cross-References :
Fluorescence and Phosphorescence Spectra, *see* Spectroscopy, 5.
See also Zodiacal Light and Gegenschein.

1. Fluorescence.

Fluorescence of Silicates under Kathode Rays. H. Peters 565

Absorption of Iodine Fluorescence in Iodine Vapour. I. I. Agarbiceanu 566

Quenching of Iodine Fluorescence by Magnetic Fields and Foreign Gases. W. Berg 567

Regularities in the Line Spectra of Solids. R. Tomaschek 634

Electric Bombardment as a Factor in Atmospheric Phenomena. W. M. Cohn 986

Monochromatic Excitation of Iodine Fluorescence. I. I. Agarbiceanu 1431

Fluorescence of Cd Vapour. (Miss) E. Kalinowska 1432

Quantitative Study of the Inhibiting Action of Certain Ions on the Fluorescent Power of Uranine. J. Bouchard 1850

Influence of Temperature on the Extinction of the Fluorescence of Dyes by Electrolytes. A. W. Banow 1851

Theory and Practice of Fluorescence Measurements. Part I. Intensity-Time Course of Fluorescence Excited by Intermittent Light. Part II. General Theory of Fluorometers. F. Duschinksy 2355

Testing the Polarisation of the K-Radiation of the X-Ray Fluorescence of Anisotropic Single Crystals. M. Groos 2356

Luminescence of Fluorites. H. Haberlandt 2358, 4878

Intensity of Fluorescence of Sodium Salicylate. P. Dubouloz 2945

Quantitative Study of the Inhibiting Action of Certain Organic Compounds on the Fluorescent Power of Uranine. J. Bouchard 2946

Distribution of Energy in the Fluorescence Bands of Mercury Vapour. I. Mrozowska 3036

Action of a Magnetic Field on the Absorption Lines of I_2. I. I. Agarbiceanu 3037

Relation between Fluorescent Intensity and Wave-Length of Exciting Light. W. Fabrikant 3494

Fluorescent Spectra and Chemical Structure of Napthalene Derivatives. A. J. Allen, Rachel Franklin and Ellice McDonald 3591

Excitation Function of the Hg Resonance Line, 2537 Å. L. S. Ornstein, H. Lindeman and J. Oldeman 3592

Destruction of Zinc-Sulphide Phosphors by α-Rays. P. M. Wolf and N. Riehl 4032

Temperature Dependence of the Scintillation Process and the Destruction of Phosphors. N. Riehl 4033

Emission of Radiation by Chemical Reactions. R. Audubert and van Doormaal 4051

Extinction of Fluorescence by Organic Substances. J. Eisenbrand 4052

Effect of the Magnetic Field on the Fluorescence of a Stream of Cadmium Atoms: Lande Factor g for State 2^3P_1. P. Soleilliet 4053

Fluorescence of Solutions and Gases. A. Boutaric and J. Bouchard 4459

Fluorescence of Sulphur Dioxide. W. Lotmar 4460

Luminescence Method of Determining the Range of α-Particles. Berta Karlik 4841

Range of α-Particles from Actinium and its Products by the Luminescence Method. Berta Karlik and Elisabeth Rona 4842

Quenching of Tellurium Vapour Fluorescence by Magnetic Fields. R. Smoluchowski 4873

Reversal of Circular Polarisation in the Fluorescence of Thallium. W. Hanle 4874

Fluorescence and Phosphorescence. Luminescence and Afterglow, *contd.*

Abstract Nos.

Fluorescence of Diatomic Molecules of Antimony. J. Genard.............. 4875
Conservation of Moment of Momentum and Polarisation Rules in Spectroscopy. Application to Light Scattering and Fluorescence. A. Kastler........ 4876
Polarisation of the Fluorescence Light from Pure Mercury Vapour. A. Kastler.. 4877
Resonance Function in Collisions of the Second Kind. W. Hanle and K. Larché 5269
Fluorescence of Diatomic Molecules of Arsenic. P. Swings and M. Migeotte 5270
Fluorescence of Aetoporphyrin. Constitution and Spectrum of Porphyrin. H. Hellström 5271
Quenching of Iodine Fluorescence by Iodine and Argon. J. F. Koehler...... 5272
Fluorescence of Fluorite. H. Haberlandt and K. Przibram.............. 5274
See also 3495, 3496, 3497 *under* 2 ; 2359 *under* 3.

2. Phosphorescence.

Structure of Nitrogen and the Different Phosphorescence of the Two Forms of Solid Nitrogen. L. Vegard 999
Spectra of Chromium in Crystals. O. Deutschbein...................... 1064
Intensities of Band Spectra of Phosphors. H. Nitka..................... 2432
Constitution of Phosphorescent Centres in Calcite. S. Iimori............ 2947
Thermoluminescent Spectrum of Calcite. S. Iimori....................... 2948
Emission of Phosphors. Part III. Behaviour of Samarium in the Oxides of Group II. R. Tomaschek and O. Deutschbein........................ 3495
Relation between Emission and Absorption Spectra of Salts of Rare Earths in the Solid State. Part I. Phosphor Activated by Rare Earths. E. Tomaschek and O. Deutschbein.................................... 3496
Fluorescence of Pure Salts of Rare Earths. R. Tomaschek and O. Deutschbein 3497
New Phosphors of the Hydrated Sulphates of Aluminium and other Metals Activated by Organic Substances. M. Travnicek........................ 4461
Solarisation of Luminiferous Calcite. S. Iimori......................... 4462
Decay of Luminescence and Light Absorption in Phosphorescent Materials. D. H. Kabakjian 5273
See also 634, 4032, 4033 *under* 1.

3. Luminescence and Afterglow.

Influence of Collisions on the Time of Decay of Na Resonance Radiation. F. Duschinsky 568
Triboluminescence. S. S. Bhatnagar, K. G. Mathur and K. L. Budhiraja.... 1000
Characteristics of the Metallic Spectra Excited by Active Nitrogen. H. Hamada 1038
Highly Rarefied Flames of Potassium Vapour with Halogens. M. Krocsák and G. Schay 1163
Auroral Spectrum. J. Kaplan 1393
Nature of Active Nitrogen. J. Okubo and H. Hamada...................... 1433
Nature of the Dark Modification of Active Nitrogen. J. Okubo and H. Hamada 1434
Investigation of the Glow of Phosphorus with the Aid of a Photoelectric Counter. C. Ouellet 2357
Luminescence and Crystal Structure. B. E. Cohn 2359
Luminescence of Alkaline Earth Tungstates Containing Lead. F. E. Swindells 2360
Afterglow of Nitrogen as a Method for Testing the Purity of the Gases Used for Filling Glow Lamps. J. A. Elzin.............................. 2949
Efficiency of the Chemiluminescence Accompanying Oxidation of Grignard Compounds. C. D. Thomas and R. T. Dufford.......................... 4054
Elementary Processes in Highly-Rarefied Flames. V. Kondratjew......... 4463
Spectrum of the Afterglow of Carbon Dioxide. A. Fowler and A. G. Gaydon 5275
See also 986 *under* 1 ; 3496, 3497, 5273 *under* 2 ; 1435 *under* 4.

4. Apparatus and Instruments.

Spectrographic Method of Luminescence Excitation. G. Heyne and M. Pirani 1435

Fluorescence and Phosphorescence. Luminescence and Afterglow, ***contd.***

Abstract Nos.

Spurious Ring Exhibited by Fluorescent Screens. J. V. Hughes.......... 2950

See also 1850, 2355, 2356, 4051, 4873 *under* 1; 3495 *under* 2; 568, 2357 *under* 3.

Galvanomagnetic and Thermomagnetic Effects.

1. Galvanomagnetic Effects:
   - (*a*) Hall and Corbino Effects.
   - (*b*) Ettingshausen Effect.
   - (*c*) Change of Resistance in Magnetic Field.
2. Thermomagnetic Effects:
   - (*a*) Nernst Effect.
   - (*b*) Leduc Effect.
3. Unclassified.

1. Galvanomagnetic Effects.

(*a*) *Hall and Corbino Effects.*

Hall E.M.F. and Intensity of Magnetisation. E. M. Pugh and T. W. Lippert 1201

Supraconductivity and the Hall Effect. I. Kikoin and B. Lasarew........ 3163

Hall Effect in Beryllium. A. Ciccone.............................. 3218

Theory of Electronic Semi-Conductors and their Possible Properties. R. H. Fowler.. 3760

Supraconductivity and the Hall Effect. E. H. Hall.................. 4226

Hall Effect and other Physical Constants of Alloys. Part I. Lead-Bismuth Series of Alloys. W. R. Thomas and E. J. Evans.................. 4666

Theory of the Anomalous Magnetic and Thermoelectric Effects in Metals. D. Blochinzev and L. Nordheim................................ 4667

Hall Effect and Internal Photoelectric Effect in Cuprous Oxide. I. Kikoin and M. Noskov.. 5450

Hall Effect and Resistance of Hydrogen-Charged Palladium-Silver and Palladium-Gold Alloys. J. Wortmann............................. 5451

(*c*) *Change of Resistance in Magnetic Field.*

Resistance Variation in Ferromagnetic Crystals. R. Gans and J. v. Harlem 1202

Change of Electrical Resistance with Magnetisation. W. Gerlach.......... 1203

Resistance Variation of Bismuth Crystals in a Magnetic Field. Part I. Electrical Method of Crystal Structure Analysis. O. Stierstadt....... 2054

Theory of Galvanomagnetic and Galvanoelastic Effects. N. Akulov....... 2055

Change of Resistance of Bi Single Crystals in Magnetic Fields. (New Phenomena). O. Stierstadt.. 2608

Influence of a Transverse Magnetic Field upon the Resistance of Liquid Metals. I. Fakidow and I. Kikoin.................................... 3219

Conductivity of Electronic Semi-Conductors in a Magnetic Field. M. Bronstein 3220

Change of Resistance of a Semi-Conductor in a Magnetic Field. J. W. Harding 3221

Influence of Barkhausen Magnetisation Jumps on the Electrical Conductivity. D. S. Steinberg and F. Miroschnitschenko.......................... 4261

Electric Resistance of Ferromagnetic Metals in Relation to the Magnetic Properties. A. Drigo.. 4668

Physical Significance of Apparent Irregularities in the Magneto-Resistance Curves of Nickel. M. M. S. Gupta and M. S. Alam................. 4669

Change of Resistance of Metals in a Magnetic Field at Low Temperatures. W. J. de Haas and P. M. van Alphen................................ 5065

Crystal Structure and Electrical Properties. Part II. Lattice Structure and Conductivity of Single Crystals of Bismuth in a Transverse Magnetic Field. O. Stierstadt... 5066

Magnetic Field in the Region of Supraconductivity. M. v. Laue and F. Möglich... 5452

See also 4667 *under* 1 (*a*).

2. Thermomagnetic Effects.

(*a*) *Nernst Effect.*

Thermomagnetic Hysteresis in Steel. W. Y. Chang and W. Band.......... 3807

3. Unclassified.

Spontaneous Magnetisation and Thermo-Remanence in Ferromagnetic Single Crystals. J. Koenigsberger.................................. 387

Passage of an Alternating Current through a Ferromagnetic Wire under Torsion. G. Valle... 774

Thermal and Magnetic Behaviour of Gadolinium Sulphate in the Temperature Range of Liquid Helium. N. Kürti................................ 2619

Correlation of Thermoelectric and Thermomagnetic Data. L. F. Bates.... 4708

Geodesy.

1. Theory.
2. Apparatus and Measurements.

Cross-References :
Isostasy, *see* Gravitation, 2.
See also Latitude and Longitude.

1. Theory.

Abstract Nos.

Boundary Value Problem of Geodesy and the Determination of Geoid Oscillations from Gravity Measurements. K. Jung 953
Formulæ of Vening Meinesz and Callandreau and other Formulæ of Higher Geodesy. N. Malkin 954
Basic Equations of Physical Geodesy. F. Hopfner 2280
Critical Justification of the Contraction Hypothesis. F. Nölke 2281
Gravity at the Geoid. F. Ackerl 2282
Physical Geodesy. F. Hopfner 2881
Figure of Earth. B. L. Gulatee 2882
Thermal History of the Earth. A. Holmes 3432
Crustal Warpings. E. A. Glennie 3995
Crustal Warpings. R. Stoneley 3996
Figure of the Earth. H. Jeffreys 4809
Integral Equation of Physical Geodesy. N. Idelson 4810
Nets of Triangles Consisting of Points with Circular Error-Curves. J. M. Tienstra 4811
See also 4812 *under* 2.

2. Apparatus and Measurements.

Measurement of the First Order Geodetic Station at Mount Crea. U. Barbieri 1800
Influence of Vertical Diurnal Oscillations on the Results of High Precision Levelling. E. Prévot 1801
Photographic Process for Preparing Topographical Maps. R. Ferber 1802
Magnetic Observations at Mogadiscio. M. Bossolasco 1824
Continental Undulations of the Geoid. R. A. Hirvonen 4812
Geodetic Operations in the United States, January 1, 1930, to December 31, 1932. W. Bowie 4813
Rapid Adjustment of Observations in Network of Geophysical Stations by the Method of Least Squares. E. Lancaster-Jones 4815
See also 2281, 2282 *under* 1.

Geophysics, Applied.

1. Surveying and Prospecting :
    (*a*) Electrical Methods.
    (*b*) Magnetic Methods.
    (*c*) Gravitational Methods.
1. Surveying and Prospecting (*contd.*) :
    (*d*) Seismic Methods.
2. Unclassified.

1. Surveying and Prospecting.

(*a*) *Electrical Methods.*

Demonstration of the Geological Possibilities of Resistivity and Magnetic Prospecting Methods. C. A. Heiland 150
Bearing of Earth's Permeability on Self- and Mutual Inductance by coils Wound on its Surface. W. F. G. Swann 392
Geoelectric Methods in Oil Prospecting. O. H. Gish 1803
Flow of Electric Current in Semi-Infinite Stratified Media. L. V. King 2005
Electromagnetic-Wave Prospecting in U.S.S.R. A. Petrowsky 2283
Potential Distribution about an Electrode on the Surface of the Earth. M. Muskat 2883
Interpretation of Electromagnetic Survey. A. Belluigi 4410
Electromagnetic Prospecting. Circular Loop Method. W. Nunier 4411
Electromagnetic Prospecting. Circular Loop Method. J. Koenigsberger 4412
Electrical Prospecting. Resistivity Method. W. Stern 4413
Geophysical Methods of Searching for Water. J. Koenigsberger 4414
Interpretation of the Resistivity Prospecting Method for Horizontal Structures. L. B. Slichter 4415
Electrical Resistivity for a Region Underlying Two Uniform Layers. I. Roman 4814
Influence of Absorbed Water on Electrical Conductivity of Rocks. (Mrs.) F. Bayard-Duclaux 5227
Registration of Earth Currents with Neutral Electrodes. S. K. Banerji 5240

Geophysics, Applied, *continued.*

Abstract Nos.

(*b*) *Magnetic Methods.*
Magnetic Survey at the Miao-erh-kou Iron Mine, South Manchuria. Y. Fujita 526
Apparatus for Measuring the Magnetic Properties of Rocks. G. Grenet 2285
Terrestrial Magnetic Elements and Structure of the Earth's Crust in Japan. T. Terada 2302
Theory of Ferromagnetic Powders and the Magnetic Susceptibility of Rocks. G. Grenet 5454
See also 150 *under* 1(a).
(*c*) *Gravitational Methods.*
Gravitational Anomaly at Mirandola. A. Belluigi 459
Comparative Measurements of "g" with the Astatic Pendulum. G. Ising 460
Gravimetric and Magnetic Balance. G. Petrucci 527
Principles and Practice of the Gradiometer. E. Lancaster-Jones 955
Influence of Vertical Diurnal Oscillations on the Results of High Precision Levelling. E. Prévot 1801
Anomalies in Lines of Equal Gravity. A. Belluigi 1804
Decreasing the Time of Gravity Torsion Balance. J. W. Joyce 2745
Direct Measurement of the Gravitational Effect of the Moon. K. Hartley 2746
(*d*) *Seismic Methods.*
Seismographic Methods for Determining Crustal Structure. B. Gutenberg, H. O. Wood and J. P. Buwalda 528
Improved Vibrograph and Applications. T. Tirunarayanachar 873
Elastic Constants of Rocks, with a Seismic Application. T. C. Richards 1382
Interpretation of Seismic Time-Distance Curves. L. B. Slichter 1397
Theory of Refraction Shooting. M. Muskat 1805
Tri-Dimensional Vibrograph. J. E. Shrader 2884
Seismic Reflection Method of Prospecting. C. A. Heiland 3427

2. Unclassified.

Report of the Fourteenth Annual Meeting of the American Geophysical Union 4416
Rapid Adjustment of Observations in Network of Geophysical Stations by the Method of Least Squares. E. Lancaster-Jones 4815

Gravitation.

1. General.
2. Terrestrial Gravity.
3. Value of "G."
4. Apparatus and Technique.
5. Unclassified.

Cross-References:
Gravitational Prospecting, *see* Geophysics, Applied, 1*c*.
Pendulums, *see also* Mechanics, Classical, 2.

1. General.

Gravitational Field of a Homogeneous Sphere. J. Ghosh 67
Stresses Near Surface of Cavity in Gravitating Solid. G. Nishimura and T. Takayama 151
Gravitation and Earth's Magnetism. T. Schlomka 2911
Class of Solution of Einstein's Gravitational Equations. C. Racine 3944
Theory of Gravitation and Electromagnetism. H. P. Soh 3945
Stresses in Gravitating Solid with Spherical Inclusion. G. Nishimura and T. Takayama 4353
Stresses in Gravitating Solid with Cylindrical Inclusion. G. Nishimura and T. Takayama 4354

2. Terrestrial Gravity.

Gravitational Anomaly at Mirandola. A. Belluigi 459
Formulæ of Vening Meinesz and Callandreau and Other Formulæ of Higher Geodesy. N. Malkin 954
Gravity in the Atlantic Area. F. A. V. Meinesz 979
Sensitive Elastic Pendulum: Contribution to Gravity Survey of France. F. Holweck 1316
Gravity Survey of Northern France. P. Lejay 1317
Depths of the Earth. R. A. Daly 1385
Measurements of the First Order Geodetic Station at Mount Crea. U. Barbieri 1800
Anomalies in Lines of Equal Gravity. A. Belluigi 1804

Gravitation, *continued.*

Abstract Nos.

Gravity at the Geoid. F. Ackerl 2282
Terrestrial Magnetic Elements and Structure of the Earth's Crust in Japan. T. Terada 2302
Observation of Gravity by Means of Invariable Pendulums. E. C. Bullard 3915
Crustal Warpings. E. A. Glennie 3995
Crustal Warpings. R. Stoneley 3996
Continental Undulations of the Geoid. R. A. Hirvonen 4812
Variations of Gravity with Time. R. Tomaschek 5146
See also 460, 527 *under* 4.

3. Value of "G."

Normal International Gravity Tables. G. Cassinis 875
Theoretical Gravity Tables according to the New International Formula. W. D. Lambert and F. W. Darling 876
Temporal Variation in Gravity. R. Tomaschek and W. Schaffernicht 1318
Temporal Variation in Gravity. E. Kleinschmidt 4355
See also 459, 2282, 5146 *under* 2; 1717 *under* 4.

4. Apparatus and Technique.

Comparative Measurements of "g" with the Astatic Pendulum. G. Ising 460
Gravimetric and Magnetic Balance. G. Petrucci 527
Improved Vibrograph and Applications. T. Tirunarayanachar 873
Recording the Falling Time of Bodies. R. M. Bowie 903
Principles and Practice of the Gradiometer. E. Lancaster-Jones 955
Gravitation Constant. J. Zahradniček 1717
Modernisation of Pendulum Apparatus. K. Wold and G. Jelstrup 2180
Magnetisation of Invar Pendulums. E. C. Bullard 2744
Decreasing the Time of Gravity Torsion Balance. J. W. Joyce 2745
Direct Measurement of the Gravitational Effect of the Moon. K. Hartley 2746
See also 1316, 3915, 5146 *under* 2; 1318, 4355 *under* 3.

Hydrodynamics and Aerodynamics.

1. Aerodynamical Theory.
2. Hydrodynamical Theory: Non-Viscous Liquids.
3. Hydrodynamical Theory: Viscous Liquids.
4. Measurement of Fluid Flow.
5. Apparatus and Technique.
6. Unclassified.

1. Aerodynamical Theory.

Aerodynamical Equation Solved Experimentally. J. Pérès and L. Malavard 68
Oscillographic Records of the Turbulent Motion Developing in a Boundary Layer from a Surface of Discontinuity. M. Ziegler 69
Circulation near a Wing of Finite Space. L. Malavard 461
Two-Dimensional Flow as a Variation Problem. G. Braun 877
Influence of Ventilation on the Readings of a Wet-Bulb Thermometer. H. Bongards 973
Current Lines Around a Cylinder of Revolution, at High Reynolds Number. J. Valensi 1718
Points of Detachment of Lines of Slip. A. Weinstein 1719
Air Pressure on a Cone Moving at High Speeds. G. I. Taylor and J. W. Maccoll 1720
Calculation Relating to Cylindrical Vessels for Storing Fluids, Subjected to Wind Pressure. K. Girkmann 2181
Rotation of Cylinder Moving Across a Wind Stream. O. C. Hilgenberg 2747
Aerofoil in Wind Tunnel of Elliptic Section. L. Rosenhead 3323
Aerodynamics of an Arrow. G. J. Higgins 3916
Fall of a Strip of Paper. J. G. Baker 3917
Kinematics and Dynamics of Stable Atmospheric Vortices. J. Letzmann 4004
Aerodynamic Characteristics of Automobile Models. R. H. Heald 4759
Interference Due to Walls of a Wind-Tunnel. L. Rosenhead 4760
Eddies in an Incompressible Viscous Fluid in Steady Planar Motion. A. Ratib 4763
Laws of Fluid Mechanics. W. F. Durand 5161
See also 1722, 2748, 3919 *under* 2; 2191, 2192, 2757, 4358 *under* 3; 3332 *under* 4; 3337 *under* 5.

Hydrodynamics and Aerodynamics, *continued.*

2. Hydrodynamical Theory : Non-Viscous Liquids.

Abstract Nos.
Theory of Wave Resistance. T. H. Havelock 462
Applications of Prolate Spheroidal Harmonics. D. M. Wrinch 470
Moment of the Force Acting on a Flat Plate Placed in a Stream between Two Parallel Walls. S. Tomotika and M. Inanuma 883
Solution of the Potential Flow for an Ideal Fluid in Two Dimensions. A. Miyadzu 1319
Hydrodynamical Problems. M. Gleijeses 1721
Translational and Rotational Currents Round a Rectilinear Obstacle. U. Cisotti 1722
Influence of Temperature on Stability of Gyrating Fluids. C. Woronetz 1723
Oscillation of Fluid in a Moving Tank. G. E. Pavlenko 1724
Resistance Experienced by a Body Moving in a Fluid Towards Its Free Surface. T. Sakai, Y. Husimi and M. Hatoyama 2182
Moment of the Force Acting on a Flat Plate Placed in a Stream Between Two Parallel Walls. S. Tomotika 2183
Impulse Theorem of Hydrodynamics for Movable Walls and Calculation of the Forces of Reaction of the Liquid. W. Müller 2184
Movement of a Rectilinear Vortex about a Deflector. G. Hamel 2748
Excitation of Waves in a Canal by Motion of a Transverse Boundary. J. M. Burgers 2749
Permanent Waves in a Circular Canal of Arbitrary Section. A. Gay 2750
Ripples due to Circular Arcs. A. Weinstein 3324
Ellipsoidal Functions and Their Application to some Wave Problems. E. T. Hanson 3918
Flow of Perfect Compressible Fluids. C. Jacob 3919
Total Dissemination of Fluid. D. Riabouchinsky 3920
Turbulence Statistics in Burgers' Phase Space. W. Tollmien 3921
Origin of Turbulence in the Case of Laminar Flow. H. Schlichting 3922
Mechanics of Liquids and Gases. Part I. L. Schiller and A. Naumann 4356
Free Oscillations of an Annular Sheet of Water Bounded by Non-Concentric Circles. H. Arakawa 4761
Path and Stability of a Local Vortex Moving Round a Corner. A. Miyadzu 4762
Plane Motion of a Perfect Incompressible Liquid. A. Gay 5147
Rigorous Determination of Permanent Periodic Waves of Finite Amplitude. (Miss) M. L. Dubreil-Jacotin 5148
See also 877, 5161 *under* 1 ; 2751, 2752, 2753, 4357 *under* 3 ; 3924 *under* 4.

3. Hydrodynamical Theory : Viscous Liquids.

Stability of Couette Flow. H. Schlichting 70
Irrotational Motion of a Liquid Confined within Rigid Movable Walls. E. Cotton 463
Flow in a Curved Pipe and Its Stability. O. Miyagi 878
Equation of Motion of a Viscous Fluid Accompanied by a "Microgyrostatic" Field. S. Watanabe 879
Transitory Régimes. C. Camichel 880
Similitude of Transient Régimes in Rotational Movements. L. Escande and P. Dupin 1725
Vortices Produced by Obstacles of Revolution Around an Axis Parallel to the General Direction of Flow. P. Dupin and M. Teissié-Solier 1726
Stability of Vortex Currents. G. Durand 1727
Movement in a Viscous Liquid Completely Filling a Space. J. Leray 2185
Movement Set Up in a Viscous Fluid by Rotation of a Cylinder. M. Luntz and P. Schwarz 2186
Alternate Annular Coaxial Eddies and Asymmetric Phenomena Associated with Rotation of a Cylinder in a Viscous Fluid. M. Luntz and P. Schwarz 2187
Movement and Wake, in Three Dimensions, of a Solid Body in a Fluid. F. Vasilesco 2188
Slow Rotation of an Anchor Ring in an Infinite Viscous Liquid. F. E. Relton 2189
Loss of Flow in Curved Channels. W. Spalding 2190
Breakdown of Streamline Motion at the Higher Critical Velocity in Pipes of Circular Cross-Section. A. H. Gibson 2191
Viscous Flow through Pipes with Cores. N. A. V. Piercy, M. S. Hooper and H. F. Winny 2192
Transitory Régimes. E. Crausse and J. Baubiac 2193

Hydrodynamics and Aerodynamics, *continued.*

Abstract Nos.
Transitory Régimes in a Cylindrical Tube Enclosing an Obstacle. E. Crausse and J. Baubiac 2194
Recent Results Relating to the Investigation of Turbulence. L. Prandtl 2195
Theory of Turbulence. F. Magyar and F. Kracmar 2196
Fluid Motion Round a Cavitation. H. Poncin 2751
Turbulent Flow. G. D. Mattioli 2752
Dynamic Considerations Relating to a Statistical Theory of Turbulence. F. Noether 2753
Propagation of Turbulence in a Free Jet. P. Ruden 2754
Growth of Vortex Motion in Water Running from a Tank. S. Watanabe 2755
New Term in the Equation of Motion in Hydrodynamics and in the Theory of Elasticity. S. Fujiwhara 2756
Modification of Oseen's Approximate Equation for the Motion in Two Dimensions of a Viscous Incompressible Fluid. R. V. Southwell and H. B. Squire 2757
Forced Rotation of Viscous Fluid. L. Sona 2758
Motion of a Viscous Fluid in the Neighbourhood of a Cylinder Rotating Uniformly, and the Law of Similitude. M. Luntz and P. Schwarz 2759
Slow Rotation of a Circular Cylinder in a Viscous Fluid Bounded by Parallel Walls. R. C. J. Howland and R. C. Knight 2760
Excentric Descent of Spheres in Hollow Cylinders containing Liquid or Gas. F. Höppler 2761
Inertia Law of Small Spheres in Frictional Media. E. Wasser 2762
Viscosities of Air, Argon and Hydrogen Chloride and Their Dependence on Temperature. J. R. Partington 2834
Slow Motion of Fluid. W. R. Dean 3325
Skin Friction of Flat Plates. N. A. V. Piercy and H. F. Winny 3326
Hydrodynamic Resistance of Cylinders. K. Vogt and A. Becker 3327
Maximum Force of Impact of a Body on the Surface of Water. F. Trey 3328
Theory of Turbulence in Canals. G. D. Mattioli 3329
Dimensional Analysis of Turbulent Flow. R. Esnault-Pelterie 3330
Mechanical Similarity in the Regular Motions of Viscous Fluids. M. Lelli 3923
New Proof of Hydrodynamic Circulation Theorem. H. Ertel 4015
Variation Principle of Atmospheric Dynamics. H. Ertel 4016
Boundary Condition for Turbulence in Pipes. G. D. Mattioli 4357
Laminar Spread of a Jet. H. Schlichting 4358
Instability of Liquid Jets. E. Tyler 4359
Inertia Law of Small Spheres in Frictional Media. T. Sexl 4360
Origin of Turbulent Flow in Tubes. H. Kurzweg 4764
Application of Statistical Mechanics to the Theory of Turbulent Fluid Motion. J. M. Burgers 4765
Constants of Hagenbach's Correction to Poiseuille's Law. M. Lippke 4766
Representation of the Flow of Gases at Low Pressures by Means of Reynolds Numbers. H. Ebert 4767
Flow Past Circular Cylinders at Low Speeds. A. Thom 5149
Small Oscillations in an Isolated Body of Liquid. W. Jardetzky 5150
Flow of Viscous Liquid Past Spinning Bodies. T. E. Garstang 5151
Two-Dimensional Steady Flow of a Viscous Fluid Behind a Solid Body. Parts I and II. S. Goldstein and A. Fage 5152
Stability of Three-Dimensional Disturbances of Viscous Fluid Flow between Parallel Walls. H. B. Squire 5153
See also 1719, 4004, 4763, 5161 *under* 1; 1319, 2184, 4356 *under* 2; 464, 465 *under* 4; 1731, 1862 *under* 5.

4. Measurement of Fluid Flow.

Hot-Wire and Spark Shadowgraphs of the Airflow through an Air-Screw. H. C. H. Townend 71
Experiments with Capillary Jets. E. Tyler and F. Watkin 464
Measurement of Critical Velocity of Flow Past Objects of Small Section by Means of a Pitot Tube. E. Tyler 465
Effect of Obstacles on Flow of an Air Jet. H. Bouasse 1728
Air Jet at Supersonic Velocities. L. Santon 1729
Flow of Water through Fine Clearances. R. J. Cornish 2763
Non-Uniform Flow of Water. F. V. A. E. Engel 3331
Currents in Neighbourhood of an Air-Screw. J. Valensi 3332

Hydrodynamics and Aerodynamics, *continued*.

Abstract Nos.

Current Produced by a Marine Screw Propeller. C. Chartier 3333
Variation of Angle of Constriction in Fluid Flowing past an Obstacle. L. Sackmann 3334
Fluidities of Thixotropic Gels: Bentonite Suspensions. H. A. Ambrose and A. G. Loomis 3889
Investigation of (Liquid) Flow in a Rotating Laboratory. H. Fette 3924
Thermoelectric Measurement of Fluid Flow. A. Égal 5154
Turbulent Flow through Fine Eccentric Clearances. R. J. Cornish 5155
Direct Measurement of Low Air Speeds. M. Ziegler 5156
See also 69 *under* 1; 2190, 3330 *under* 3; 881, 976, 3338 *under* 5.

5. Apparatus and Technique.

Standard Pitot-Static Tube Calibration at Low Speeds. E. Ower and F. C. Johansen 466
Scientific Instruments and Aeronautics. H. E. Wimperis 467
Fluid Flow Past an Obstacle. R. Thiry and L. Sackmann 881
Sensitive Recording Altimeter and Thermometer for Aircraft. P. Idrac 882
Directional Effect of the Single Hot-Wire Anemometer. M. Ziegler 976
Demonstration Apparatus for Showing Stream-Lines. C. Wieselsberger 1320
Recording of Stream Lines. U. Mennicke 1730
Flow of Water through Tubes. D. Nukiyama 1731
Modification of the Chronophotographic Method and Applications. E. Crausse and J. Baubiac 1862
Mechanical Imitation of Flight of Birds and Winged Insects. G. Castagneris .. 2764
Hot-Wire Apparatus for the Study of Air Movements Produced by the Flapping Wing of a Bird or Insect. A. and C. Magnan 2765
Speedometer to Indicate True Airspeeds. T. Sasaki and T. Yosida 2766
Optical Determination of the Direction of Motion of Air Streams. A. Magnan 3335
Dimensional Homogeneity Applied to the Standard Orifice. H. W. Gardner .. 3336
New Indicator of Angle of Attack. M. Roger 3337
Comparison of Pitot Dynamic Tubes. Leroux 3338
Permeability of Porous Media for Homogeneous Fluids. R. D. Wyckoff, H. G. Botset, M. Muskat and D. W. Reed 3435
Heating of a Cylindrical Body by Rapid Movement through the Air. E. Brun 4582
Reducing Resistance to Motion through a Fluid. S. Nikitine 5157
Flow Past an Obstacle between Parallel Plates. L. Sackmann 5158
Striation in the Boundary Layer Surrounding a Solid. D. Riabouchinsky 5159
Striation in the Boundary Layer Surrounding a Solid. V. Volkovisky 5160
Theory and Use of Interference and Refractometer. H. Schardin 5279
See also 68, 69, 461, 1718 *under* 1; 1725, 2187, 4359, 4764 *under* 3; 71, 464, 465, 1728, 3331, 3924 *under* 4.

6. Unclassified.

Design of Aerofoil Sections. C. Schmieden 72
Hydraulic Analogy Corresponding to the Motion of a Compressible Fluid D. Riabouchinsky 468
Wind Tunnel Development of a Proposed External Form of Steam Locomotives. J. J. Green 1732
Wind Pressure on a Model of the Empire State Building. H. L. Dryden and G. C. Hill 2767
Hydrodynamics and the Kinetic Theory of Gases. Theory of Surface Tension. Y. Rocard 4378

Hydrosphere, Physics of the.

1. Thermal Data.
2. Optical Data.
3. Ocean Tides and Currents.
4. Inland Lakes. Rivers.
5. Unclassified.

1. Thermal Data.

Submarine Phenomena in the Bay of Villefranche-sur-Mer. Idrac 956

2. Optical Data.

Light Intensity at Different Depths in Lake Water. H. A. Erikson 2935
Light Penetration in the Waters of the San Juan Archipelago. C. L. Utterback and J. W. Boyle 4816
Light Penetration in the Waters of Southern Alaska. C. L. Utterback 4817

Hydrosphere, Physics of the, *continued.*

3. Ocean Tides and Currents.

Abstract Nos.

Apparatus to Measure and Record Vertical Submarine and Sub-Lake Currents. Idrac 1383
Omission in the Classical Theory of Tides. O. Pettersson 1806
Influence of the Pacific on the Circulation in the South-West Atlantic Ocean. A. J. Clowes 1807
Principal Semi-Diurnal Constituent of Tidal Motion in the Gulf of Mexico. S. F. Grace 2284
Effect of a Theoretical Tidal Variation of the Zenith on the Annual Variation of Latitude. J. C. Dobbie 2846
Dynamical Explanation of Tides. S. F. Grace 2885
Tidal Bibliography. J. Proudman 2886
Measuring Machine for Tidal Curves. S. E. Stenij 2887
Oscillations in a Bounded Water-Basin. S. E. Stenij 2888
Theory of the Rising Stage of Drift Current in the Ocean. Part I. Case of No Bottom-Current. T. Nomitsu 3428
Development of Slope Current and Barometric Current in the Ocean. Part I. Case of No Bottom-Current. T. Nomitsu 3429
Tides on a Rotating Globe. Part IV. G. R. Goldsborough 3430
Tides in a Hemispherical Ocean Bounded by a Continental Shelf along a Meridian. R. O. Street 3997
Wind Currents in Heterogenous Waters. K. Hidaka 3998
Non-Steady Ocean Currents. Part I. K. Hidaka 3999
New Proof of the Hydrodynamic Circulation Theorem. H. Ertel 4015
Ocean Currents Produced by Evaporation and Precipitation. G. R. Goldsborough 4417
Problem of Tidal Theory. O. Pettersson 5228
See also 956 *under* 1.

4. Inland Lakes. Rivers.

Practical Application of Periodogram Analysis. J. W. Sandström 889
See also 1383, 1806, 2885, 2886, 2887, 2888 *under* 3.

5. Unclassified.

Radium Content of Ocean-Bottom Sediments. C. S. Piggot 2310
Simplified Procedure for the Calculation of Pressure and Mass Distribution in the Sea. H. U. Sverdrup 4000

Interference, Diffraction and Scattering (Radiation).

1. Interference Effects.
2. Interference, Applications.
3. Diffraction.
4. Scattering.
5. Apparatus and Instruments.
6. Unclassified.

Cross-References :
Compton Effect, *see* X-Rays, 2.
Electric Waves, *see* Radiation, Emission, 4.
Meteorological Optics (Corona, Halo, etc.), *see* Meteorology, 6.
Raman Effect, *see* Spectroscopy, 8.

1. Interference Effects.

Image Formation of Non-Self-Luminous Objects. C. Münster 1024
Optical and Photoelectric Investigations of Thin Metallic Films. R. Schulze 1657
Colour in Films of Sputtered Tin. C. J. Overbeck 2361
Measurement of Gradual Variations of Refractive Index. A. Biot 2396
Interference of Wide-Aperture Cone of Light. S. I. Wawilow and E. M. Brumberg 2951
Standing Light Waves. Repetition of an Experiment by Wiener, Using a Photoelectric Probe Surface. H. E. Ives and T. C. Fry 2952
Reflection of Electrons from Standing Light Waves. P. L. Kapitza and P. A. M. Dirac 3204
Interference of Light in Metallic Films. J. B. Nathanson 5276
See also 1441 *under* 5.

For the Key to this Index see pp. 1358 to 1372.

Interference, Diffraction and Scattering (Radiation), *continued.*

2. Interference, Applications.

Abstract Nos.
Determination of the Relationship between Wave-Lengths of Light and the Fundamental Standards of Lengths. J. E. Sears, Jr. and H. Barrell 79
Optical Investigation of the Accommodation Coefficient of Molecular Translation and the Distribution Function of the Latter in an Attenuated Gas. L. S. Ornstein and W. R. v. Wyk 469
Interferometer Measurements in the Extreme Ultra-Violet Region of Copper. J. C. McLennan and (Miss) F. M. Quinlan 589
Vacuum Apparatus for Measuring Thermal Expansion at Elevated Temperatures, with Measurements on Pt, Au, Mg and Zn. J. B. Austin 649
Axial Arrangement for the Measurement of Length by the Interference of Light. J. Stulla-Götz 886
Shape of Profiles of Liquid Films Draining on a Vertical Watted Plate, and An Investigation of the Plate Ridge. J. Satterly and E. L. Stuckey 1356
Triple Interferometer for Distinguishing Flexural and Longitudinal Vibrations in Quartz. H. Osterberg 1436
Interferential Comparison of Radiations Emitted by a New Cadmium Lamp and the Michelson Lamp. J. E. Sears, Jr., and H. Barrell 1437
Interferometer Measurements in t[illegible]me Ultra-Violet Region of Copper. J. C. McLennan and F. M. Quinlan 1482
Interference Method of Measuring Thermal Expansion. G. E. Merritt 1537
Variation of Phase by Reflection from Thin Metallic Films. P. Rouard 1875
Swelling of Plane Gelatin Plates. Interferometric Investigations. Part IV. P. Kornmann 2688
Refractive Indices of Solid Bodies. A. Biot 3000
New Interference Micrometric Method Applicable to Double Stars and Satellites of Jupiter. A. Danjon 3398
Variation of Phase by Reflection from Very Thin Metallic Films. P. Rouard .. 3524
Interference Fringes in Stress Analysis. M. M. Frocht 3912
Determination of the Magnitude of Ultramicrons with the Interference Microscope. A. Klimmeck 4879
Interferometric Examination of Cleavage Faces of Crystals. M. Siegbahn 5130
See also 1852, 4466, 4910 *under* 5.

3. Diffraction.

Optical Properties of Solids and Liquids under Ultrasonic Vibrations. R. Lucas and P. Biquard 569
Diffraction of Light by Elastic Waves. R. Lucas 1145
Photographic Method of Deriving the Optical Constants of Metals. S. E. Williams 1438
Talbot's Bands. A. C. G. Beach 2954
Diffraction of Light by Ultrasonic Sound Waves. R. Bär and E. Meyer 3498
Formula for Diffraction by a Perfect Grating. C. Eckart 3655
Diffraction at Small Spheres near the Focus of Convergent Spherical Waves. F. Möglich 4464
See also 1024 *under* 1; 3499 *under* 5.

4. Scattering.

Scattering Processes of Higher Order. P. Güttinger 183
Scattering of Light. W. D. Bancroft and C. Gurchot 184
Light Scattering in Supercooled Benzophenone. W. T. Richards and P. M. Harris 185
Properties of an Optically Turbid Medium. Part III. Illumination of Heterogeneous Curved Layers. Theory of the Crimson Light. P. Gruner 536
Extension of Woo's Formula. Intensity of the Light Diffused by an Electron in Motion. C. Cannata 570
Scattering of Light by Sound Waves. P. Debye 679
Theory of Critical Opalescence. Y. Rocard 1001
Molecular Rotation in Liquids. S. P. Ranganadham 1909
Extinction Coefficient for Dust in Short-Wave and Ultra-Violet Light. H. v. dem Borne 2955

Interference, Diffraction and Scattering (Radiation), *continued.*

Abstract Nos

Light Distribution in Diffusing Media. W. A. Fabrikant, W. L. Ginsburg and W. L. Pulver 2956
Theory of Fluctuations and Critical Opalescence. Y. Rocard 2957
Optical Properties of Photographic Films. E. Lau and J. Johannesson 2969
Visibility of Objects Illuminated by a Projector. Part II. Y. Rocard. Part III. Part III (continued). J. Rivière and Y. Rocard 3052, 4127, 4955
Theory of Scattering by a Force Centre 3357
Scattering and Absorption of Electromagnetic Radiation by a Small Sphere. G. Beck and P. Wenzel 4465
Conservation of Moment of Momentum and Polarisation Rules in Spectroscopy. Application to Light Scattering and Fluorescence. A. Kastler.......... 4876
Scattering of Light by Excited Atoms. V. Weisskopf 5277
Experimental Evidence for the Absence of Scattering of Light by Light. F. L. Mohler.......... 5278

5. Apparatus and Instruments.

Production of Hard Surfaces on Invar Étalons by Electroplating. F. Adcock and H. Barrell 79
Dispersion of Gases and Vapours and Representation by the Dispersion Theory. Part III. Dispersion of Oxygen between 6000 Å and 1920 Å. R. Ladenburg and G. Wolfsohn 586
Geometry of the Jamin Refractometer. S. E. Green.......... 1031
Multiplex Step-like Gratings. E. Lau.......... 1439
Theory of Multiplex Step-like Gratings. P. Görlich.......... 1440
Simple Method of Producing and Projecting Mercury Ripples. A. R. Harmon and J. B. Brinsmade 1441
Advantages and Disadvantages of the Dispersion in the Plate Prism of the Lummer-Gehrcke Plate. Magdalena Adam 1479
Energy Distribution in Grating Spectra. U. Schmieschek and E. Spiller.... 1521
Influence of Dispersion on the Indications of the Haber-Löwes Gas Interferometer. E. Karwat 1852
Sonic Nephelometer. J. S. Wilson 2347
Duboscq Instrument for Colorimetry, Nephelometry and Colorimetric Determination of Hydrogen-Ion Concentrations. J. Grant and J. H. W. Booth 2350
Ruling Errors of Diffraction Gratings. P. H. Brodersen and O. Zeising.... 2449
Amplifying Lever for Measurement of Small Displacements. G. A. Fink and G. W. Fox 2768
Interferometer for Analysing the Vibrations of a Quartz Plate. H. Osterberg 2958
Experimental Investigation of Grating-Ghosts. W. Rudolph.......... 3049
Occurrence of Interference Patterns with Uniform Grating Images in the Refraction Field of a Strip Grating. H. Weisel.......... 3499
Astigmatism of the Concave Grating. G. H. Dieke.......... 4055
Interferometry. Part II. Construction, Testing and Use of Reflection Échelons for the Visible and Ultra-Violet Regions. W. E. Williams.... 4466
Eagle Mounting for a 3-m. Concave Grating. W. H. J. Childs 4467
Aberrations of the Concave Grating at Large Angles of Incidence. I. S. Bowen 4544
Adaptation of the Interferometer for Hyperfine Structure. G. S. Monk.... 4880
Rotating Chamber for the Determination of Refractive Indices of Solutions by Interferometry. A. Kruis and W. Geffcken 4910
Dispersion of Gases and Vapours. Part V. Interferometer for Schumann Region. G. Wolfsohn 4912
Theory and Use of Interference Refractometer. H. Schardin.......... 5279
Polarisation Interferometer. A. Dufour 5280
Precise Measurement of Optical Path-Difference, Especially in Stressed Glass. R. W. Goranson and L. H. Adams 5290
See also 1024, 2951, 2952 *under* 1; 886, 1436, 3398 *under* 2; 569, 1438, 2954 *under* 3; 185 *under* 4.

6. Unclassified.

Some Infra-Red Interference Spectra. J. W. Ellis.......... 3050

For the Key to this Index see pp. 1358 to 1372.

Kinetic Theory of Matter.

1. Gases.
2. Radiometer Effect.
3. Atomic and Molecular Rays.
4. Liquids and Solids.
5. Brownian Motion.
6. Unclassified.

Cross-References :
Electrons, Motion of, *see* Electrons, Positrons and Protons, 3 and 5.
Photophoresis, *see* Radiation, Mechanical Effects of, 2.
V.P.T. Relations, Experimental, *see* Elasticity and Plasticity, 2 ; Theoretical, *see* Thermodynamics, 2.

1. Gases.

Abstract Nos.

Relativity Correction to Maxwell's Law of Distribution of Velocities. A. Busemann 73
Optical Investigation of the Collision of Gas Atoms with a Wall of the Enclosure. L. S. Ornstein and W. R. van Wÿk 74
Optical Investigation of the Accommodation Coefficient of Molecular Translation and the Distribution Function of the Latter in an Attenuated Gas. L. S. Ornstein and W. R. v. Wÿk 469
Friction, Thermal Conductivity and Diffusion in Gaseous Mixtures. Parts XXI, XXII, and XXIII. M. Trautz 643, 3079, 3080
Accommodation Coefficient of Gaseous Ions at Kathodes. K. T. Compton.... 1156
Effective Cross-Sections of Molecules According to the Kinetic Gas Theory. Part II. H. E. Binkele 1321
Resistance of Small Spheres in Motion through Air. G. Mönch 1322
Theory of Inelastic Collision between Atoms. E. C. G. Stueckelberg.......... 1323
Interchange of Vibrational and Translational Energy. C. Zener.......... 1324
Entropy of Polyatomic Molecules and the Symmetry Number. J. E. Mayer, S. Brunauer and Maria G. Mayer 1560
Vapour Viscosities and the Sutherland Equation. J. H. Arnold.......... 1771
Probability and the Exponential Laws of Physics. M. C. Holmes 2204
Exchange of Energy between Polyatomic Molecules and a Metallic Surface. F. R. Whaley 2473
Wave Mechanical Significance of the Apparent Radii of Atoms and Ions. J. A. Wasastjerna 2799
Viscosity of Gases and Other Problems of Kinetic Theory. N. Gerasimov.... 2830
Energy Exchange at a Platinum-Hydrogen Interface. H. H. Rowley and K. F. Bonhoeffer 3075
Self-Diffusion of Hydrogen. P. Harteck and H. W. Schmidt.......... 3307
Mean Free Path in Rare Ionised Gases. V. C. A. Ferraro 3339
Relativistic Partition of Energy in Gases. P. E. Böhmer.......... 3340
Viscosity of Homogeneous Fluids. R. O. Herzog and H. Kudar.......... 3384
Calculation of the Second Virial Coefficient of Gases. T. S. Wheeler.......... 3697
Detection of Adsorbed Gas Films on Heated Filaments. G. van Praagh 3870
Free Paths and Transport Phenomena in Gases and the Quantum Theory of Collisions. Part I. Rigid Sphere Model. H. S. W. Massey and C. B. O. Mohr 3940
Optical Determination of the Diffusion Constant of Sodium. L. A. Ginsel and L. S. Ornstein 4342
Hydrodynamics and the Kinetic Theory of Gases. Theory of Surface Tension. Y. Rocard 4378
Molecular Theory of Gases. Part I. M. Trautz 4983
Correction for Thermo-Molecular Flow. F. C. Tompkins and D. E. Wheeler 5188
Energy Exchange between Inert Gas Atoms and Solid Surface. J. M. Jackson and A. Howarth 5363
Exchange of Energy between Gas Atoms and Solid Surfaces. Part III. Accommodation Coefficient of Neon. J. K. Roberts.......... 5364
See also 2197, 3341, 3925, 4772 *under* 5.

2. Radiometer Effect.

Investigations on Radiometers. Part IV. W. Gerlach and W. Schütz...... 75
Radiometer Action and Pressure of Radiation. Mary Bell and S. E. Green.. 2389
Crookes Radiometer and the Intensity of Radiation. G. Russell.......... 2983

3. Atomic and Molecular Rays.

Reflection of Atomic Beams from Sodium Chloride Crystals. R. M. Zabel.... 76
Reflection of Metallic Atoms from Alkali Halide Crystals. R. R. Hancox.... 1325

Kinetic Theory of Matter, *continued.*

Abstract Nos.
Scattering of Molecular Rays in Gases. Part I. F. Knauer.............. 1326
Surface Motion of Sputtered Particles. R. W. Ditchburn.................. 1589
Measurement of Dipole Moments by Means of a Molecular-Ray Method. M. Wohlwill 1614
Magnetic Moments of K and Li with Regard to their Nuclear Magnetic Moments. W. Meissner and H. Scheffers 1642
Reflection of Hg Molecular Rays at Crystal Surfaces. B. Josephy.......... 1733
Experimental Test of Quantisation in Direction. R. Frisch and E. Segrè.... 1749
Electric Moments by the Molecular-Ray Method. I. Estermann and M. Wohlwill 2579
Magnetic Moments of K and Li with Regard to their Nuclear Magnetic Moment. Part II. W. Meissner and H. Scheffers.............................. 2624
Gas-Adsorption on Electrically Conducting Films During their Condensation from Molecular Rays. M. C. Johnson and T. V. Starkey............... 2666
Deflection of Molecular Rays in an Electric Field: Electric Moment of Hydrogen Chloride. I. Estermann and R. G. J. Fraser.................. 3781
Anomalies in the Reflection and Diffraction of Molecular Rays from Crystal Cleavage Faces. Parts I and II. R. Frisch and O. Stern............. 4768
Intensity Measurement of Molecular Rays. I. Estermann and O. Stern.... 4769
Molecular Scattering in Gases. Part I. Method of Crossed Molecular Beams. R. G. J. Fraser and L. F. Broadway. Part II. Collision of Sodium and Potassium Atoms with Mercury. L. F. Broadway................. 4770
Magnetic Deviation of Hydrogen Molecules and the Magnetic Moment of the Proton. Part I. R. Frisch and O. Stern.......................... 5075
Magnetic Deviation of Hydrogen Molecules and the Magnetic Moment of the Proton. Part II. I. Estermann and O. Stern....................... 5076
Magnetic Deviation of Oxygen Molecules. R. Schnurmann.................. 5078
See also 74 *under* 1.

4. Liquids and Solids.

Quantum Theory of Latent Heat. H. C. Kudar........................... 1116
Kinetic Theory of Fluids. R. O. Herzog and H. C. Kudar................. 1327
Inertia Law of Small Spheres in Frictional Media. E. Wasser............. 2762
Inertia Law of Small Spheres in Frictional Media. T. Sexl................ 4360
See also 3384 *under* 1.

5. Brownian Motion.

Orientation and Deformation of Disperse Particles in Streaming Liquids. W. Haller 11
Brownian Motion in Fields of Force. J. Métadier.......................... 77
Noises in Amplifiers of Photoelectric Cells. F. v. Orbán 316, 4287
Brownian Movement Limits for Series of Observations. F. Zernike......... 884
Experimental Study of the Time Course of the Brownian Motion of a Torsional Pendulum. E. Kappler 885
Brownian Motion of the Resonance Radiometer. G. A. van Lear, Jr......... 1328
Influence of Brownian Movement on the Viscosity of Suspensions. R. Eisenschitz 1679
Geometrical and Physical Conditions of Polished Surfaces. G. Schmerwitz 1734
Effect of Heat Flow on Brownian Movement. M. Satô..........2197, 3925, 4772
Classical Statistics and Quantum Mechanics. R. Fürth..................... 2225
Thermodynamical Fluctuations. M. v. Laue.............................. 3103
Effect of Heat Flow on Brownian Motion. K. Sitte......................... 3341
Theory of Brownian Motion and Operational Method. J. Métadier 3926
Calculation of Mean Brownian Area. A. Kolmogoroff and M. Leontowitsch 4361
Brownian Motion. M. Satô.. 4771
Viscosity of Solutions, in Particular of Solutions of Substances of High Molecular Weight. E. Guth and H. Mark................................ 5189

6. Unclassified.

Theoretical Considerations Concerning the Separation of Isotopes. H. Eyring and A. Sherman 3283

Land, Physics of the.

1. Earth's Interior.
2. Thermal Phenomena.
3. Physical Properties of Rocks.
4. Soil Physics.
5. Earth Tides.
6. Unclassified.

Cross-References :
Isostasy, *see* Gravitation, 2.
Lakes, Rivers, Seiches, *see* Hydrosphere, Physics of the, 4.

1. Earth's Interior.

Abstract Nos.
Earth Structure. E. A. Hodgson 1384
Depths of the Earth. R. A. Daly 1385
Earthquakes and Variations in Latitude. H. Nagaoka 1395
Terrestrial Magnetic Elements and Structure of the Earth's Crust in Japan. T. Terada 2302
Variation in the Rotation of the Earth and Volcanic Eruptions. H. Nagaoka 2889
Variation in the Effective Rigidity of the Earth. H. Nagaoka 3431
Volcanic Eruptions, Earthquakes and Pole-Shift. H. Nagaoka 3447
Crustal Warpings. E. A. Glennie 3995
Crustal Warpings. R. Stoneley 3996
See also 3432 *under* 2.

2. Thermal Phenomena.

Diluvial Ice Age in Equatorial Regions. R. Spitaler 2289
Thermal History of the Earth. A. Holmes 3432
Measurement and Interpretation of Deep Earth Temperatures. C. E. van Orstrand 3433
Continuous Generation of Heat in Certain Silicates. E. A. Harrington 5229
Cooling of a Radioactive Sphere. A. N. Lowan 5230

3. Physical Properties of Rocks.

Radium in Hungarian Rocks. S. S. de Finály 548
Flow of Heat from a Rock Stratum in which Heat is being Generated. C. E. van Orstrand 957
Thermomagnetic Properties of Volcanic Rocks. R. Chevallier and J. Pierre.. 958
Temporal Variation in Gravity. R. Tomaschek and W. Schaffernicht 1318
Elastic Constants of Rocks, with a Seismic Application. T. C. Richards 1382
Radioactive Content of Rocks by the Geiger-Müller Counter. W. Vogt 1412
Electromagnetic-Wave Prospecting in U.S.S.R. A. Petrowsky 2283
Apparatus for Measuring the Magnetic Properties of Rocks. G. Grenet 2285
Determination of Uranium and Thorium in Rocks. H. Gräven 2306
Radioactivity of New Pre-Cambrian Granite of South Finland. H. Gräven and G. Kirsch 2307
Microscopic Investigation of a Crystal of a Morogoro Ore. H. Haberlandt.... 2308
Direct Fusion Method for Determining the Radium Content of Rocks. R. D. Evans 2309
Radioactivity Measurements. Part I. Radium Content of Keweenawan Basalts and Accessory Minerals. Part II. Occurrence of Radium, Uranium and Potassium in the Earth. W. D. Urry 2314
Thermal Conductivities of Rocks. H. A. Nancarrow 3081
Magnetic Properties of Igneous Rocks. A. F. Hallimond and E. F. Herroun.. 4001
Temperal Variation in Gravity. E. Kleinschmidt 4355
Young's Modulus and Poisson's Ratio with Reference to Geophysical Applications. W. A. Zisman 4418
Compressibility and Anisotropy of Rocks At and Near the Earth's Surface. W. A. Zisman 4419
Comparison of Statically and Seismologically Determined Elastic Constants of Rocks. W. A. Zisman 4420
Velocity of Elastic Waves in Granite and Norite. L. D. Leet 4818
Influence of Absorbed Water on Electrical Conductivity of Rocks. (Mrs.) F. Bayard-Duclaux 5227
Theory of Ferromagnetic Powders and the Magnetic Susceptibility of Rocks. G. Grenet 5454
See also 1385 *under* 1 ; 3432 *under* 2.

4. Soil Physics.

Radiation in the Atmosphere. D. Brunt 153
Application of Boltzmann's Principle to Certain Kinds of Movement. G. I. Pokrowski 1386

Land, Physics of the, *continued.*

Abstract Nos.

Capacitance Hygroscopy and Some Applications. W. L. Balls and R. K. Schofield 1616
Minimum Capillary Rise in an Ideal Uniform Soil. W. O. Smith 2890
Radio Properties of the Soil. R. L. Smith-Rose 3434
Permeability of Porous Media for Homogeneous Fluids. R. D. Wyckoff, H. G. Botset, M. Muskat and D. W. Reed 3435
Mechanical Properties of Disperse Systems. Part I. Deformations of Building Ground by Pressure. G. I. Pokrowski and W. G. Bulytschew 4311
Pressure Exerted by Granular or Pulverulent Material. Z. Anzo 4819
Terrestrial Reactions to Variations of Solar Activity. A. Nodon 5238
Registration of Earth's Currents with Neutral Electrodes. S. K. Banerji 5240

5. Earth Tides.

See also 1318, 4355 *under* 3.

6. Unclassified.

Stresses Near Surface of Cavity in Gravitating Solid. G. Nishimura and T. Takayama 151
Earth Rotation and River Erosion. H. L. Fairchild 529
Earth Fractures. M. Billings 1808
Stresses in Gravitating Solid with Spherical Inclusion. G. Nishimura and T. Takayama 4353
Stresses in Gravitating Solid with Cylindrical Inclusion. G. Nishimura and T. Takayama 4354

Latitude and Longitude.

Cross-Reference: See also Geodesy.

Determination of Accelerations and Fluctuations in Motions of Sun and Moon. J. K. Fotheringham 524
Direct Method to Determine the Azimuth of a Signal. B. Berloty 918
Hornsby's Observations of Mercury, 1774-1798. J. Jackson 1368
Earthquakes and Variation in Latitude. H. Nagaoka 1395
Measurements of the First Order Geodetic Station at Mount Crea. U. Barbieri 1800
Preliminary Work for the International Longitude Measurements, 1933. E. Lange 2253
Variation Effect in Latitude Correlatable with the Moon. H. T. Stetson 2254
Effect of a Theoretical Tidal Variation of the Zenith on the Annual Variation of Latitude. J. C. Dobbie 2846
Variation in the Rotation of the Earth and Volcanic Eruptions. H. Nagaoka 2889
Volcanic Eruptions, Earthquakes and Pole-Shift. H. Nagaoka 3447
Nineteen-Year Period of Earthquake Frequency. C. Davison 3450
Simple Apparatus to Measure the Personal Equation in Instrumental Observations of Constant Altitudes. E. Buckar 5200

Length (Standards, Measurements, Apparatus).

1. Standards.
2. Apparatus and Measurements.

Cross-References:
Variation of Length with Temperature, *see* Dilatation, 1.
Units, *see* Mathematical Methods, etc., 3.

1. Standards.

Determination of the Relationship between Wave-Lengths of Light and the Fundamental Standards of Length. J. E. Sears, Jr., and H. Barrell 79
Interferential Comparison of Radiations Emitted by a new Cadmium Lamp and the Michelson Lamp. J. E. Sears, Jr., and H. Barrell 1437

2. Apparatus and Measurements.

Measurement of Small Changes of Length. R. Mohr 78
Axial Arrangement for the Measurement of Length by the Interference of Light. J. Stulla-Götz 886
Reichenbach Method of Indirect Measurement of Length. T. Eversmann 887
Geometrical and Physical Conditions of Polished Surfaces. G. Schmerwitz 1734
Apparatus for Comparing the Length of Gauges. C. Moon 1735
New Method of Measurement of the Thickness of Metal Films. S. Tanaka 1879

Length (Standards, Measurements, Apparatus), *continued.*

Abstract Nos.

Magnetic Method for Measurement of Thicknesses. P. Bricout 2198
Amplifying Lever for Measurement of Small Displacements. G. A. Fink and G. W. Fox 2768
Interferometry. Part II. Construction, Testing and Use of Reflection Échelons for the Visible and Ultra-Violet Regions. W. E. Williams 4466
Estimation of Tenths on a Scale. H. Bäckström 5162
See also 79 *under* 1.

Magnetism and Electromagnetism.

1. Theory.
2. Ferromagnetism.
3. Diamagnetism and Paramagnetism.
4. Electromagnetic Field and Electrodynamics.
5. Electromagnetic Induction. Inductance.
6. Magneto-Mechanical Effects (Gyromagnetic Effect and Magnetostriction).
7. Apparatus and Technique.
8. Unclassified.

Cross-References :
Earth's Magnetism, *see* Terrestrial Electricity and Magnetism, 2.
Eddy Currents, *see* Conduction (Electric) in Solids and Liquids, 5.

Cross-References (contd.) *:*
Effect of Magnetic Field on Resistance, *see* Galvanomagnetic and Thermomagnetic Effects.
Inductive Networks, *see* Alternating-Current Networks, 1.
Instruments for Measuring Current, Voltage and Resistance, *see* Conduction (Electric) in Solids and Liquids, 2, 3 and 4.
Skin Effect, *see* Conduction (Electric) in Solid and Liquids, 5.
Units, *see* Mathematical Methods, etc., 3.

1. Theory.

Generalisations of Maxwell's Theory. Irene E. Viney 763
Weiss Molecular Field. K. Honda 764
Free Electrons in a Crystalline Lattice. Wave Equation and Magnetic Properties. L. Brillouin 893
Magnetic Properties of the Borides of the Rare Earths. W. Klemm, W. Schuth and M. v. Stackelberg 1204
Applications of the Absolute Differential Calculus to Physics. C. Kaplan 1331
Analogy between Equations of the Quantum Theory and Maxwell's Equations. M. Fahmy 1638
Transition from the Integral to the Differential Laws in Electromagnetism and Induction. R. Chevallier 2056
Interpretation of Weiss' Law. H. Fahlenbrach and E. Vogt 2609
Variational Principles of Electromagnetism. H. Bateman 2610
Atomic Moments in Ferromagnetic Metals and Alloys with Non-Ferromagnetic Elements. E. C. Stoner 3223
Magnetic Definitions from the Circuital Standpoint. A. E. Kennelly 3808
Stereomagnetism. Parts I and II. O. v. Auwers and H. Kühlewein 3809
Magnetic Dipole Fields in Unstrained Cubic Crystals. L. W. McKeehan 3810
Magnetic Dipole Fields in Dislocated Cubic Crystals. L. W. McKeehan 3811
Magnetic Dipole Energy in Homogeneously Strained Cubic Crystals. L. W. McKeehan 3812
Magnetic Dipole Energy in Hexagonal Crystals. L. W. McKeehan 3813
Magnetic Quadripole Field and Energy in Cubic and Hexagonal Crystals. L. W. McKeehan 3814
Integration of the Maxwell-Hertz Equations in Uniaxial Crystalline Media. A. Tonolo 4262
Poynting's Vector. F. Prunier 4263
Theory of the Exchange Problem and of Ferromagnetism at Low Temperatures. C. Møller 4265
Electromagnetic Analogy. E. Frola 5067
Heaviside's Calculus. K. T. Vahlen 5068
Magnetic Dipole Fields in Unsaturated Cubic Crystals. L. W. McKeehan 5069
See also 767, 3229 *under* 2 ; 3833 *under* 3; 3838 *under* 5 ; 779, 780, 5465 *under* 6.

2. Ferromagnetism.

Physical Properties and Structure of the Binary System Iron-Cobalt. A. Kussmann, B. Scharnow and A. Schulze 28
Magnetic Behaviour of Isotropic Ferromagnetic Materials. R. Gans 385
Magnetic Effects in Iron Crystals. A. G. Hill 386

Magnetism and Electromagnetism, *continued.*

Abstract Nos.
Spontaneous Magnetisation and Thermo-Remanence in Ferromagnetic Single Crystals. J. Koenigsberger 387
Materials of High Magnetic Susceptibility. F. Stäblein 388
Propagation of Large Barkhausen Discontinuities. Parts II, III and IV. K. J. Sixtus and L. Tonks 765, 1647, 3820
Time Phenomena, Creation and Stabilisation of Large Magnetic Effects or Discontinuities. F. Hülster 766
Permeability of Iron at Ultra-Radio Frequencies. J. B. Hoag and H. Jones 767
Metallic Films and Surfaces. K. Richter 843
Thermomagnetic Properties of Volcanic Rocks. R. Chevallier and J. Pierre .. 958
Ferromagnetic Crystals. R. Gans 1205
Anomalous Behaviour of Permeability at High Frequencies. W. Arkadiew .. 1206
Quantitative Method for Investigating the Texture of Rolled Metal. N. Akulov and N. Brüchatov 1207
Complicated Magnetic Structure of Single Ferromagnetic Crystals. N. Akulov and M. Degtiar 1208
Mono-Crystal Barkhausen Effects in Rotating Fields. F. J. Beck Jr. and L. W. McKeehan 1209
Theory of Induced Magnetism. L. R. Wilberforce 1639
Observations Relating to Bitter Bands on an Iron-Silicon Plate. R. Becker and H. F. W. Freundlich 1640
Theory of the Ferromagnetic Anisotropy of Single Crystals. R. M. Bozorth .. 1641
Cooperative Phenomena. F. Zwicky 1700
Interatomic Distances and Ferro-Magnetism. E. C. Stoner 2611
Calculation of the Permeability and Hysteresis Loss in Ferromagnetic Laminæ by Suitable Frequencies. W. Arkadiew 2612
Extension of the Theory of Magnetisation Curves of Ferromagnetic Single Crystals. R. Gans and E. Czerlinsky 2613
Rôle of Electron Path Impulses in Ferromagnetic Lattices. H. Ludloff and G. Reymann 2614
Magnetisation of Invar Pendulums. E. C. Bullard 2744
Law of Discontinuous Distribution of Ferromagnetic Curie Points. Parts I, II and III. R. Forrer 3224, 3225, 5453
Magnetic Properties of the Iron-Nickel Alloys under Hydrostatic Pressure. R. L. Steinberger 3226
Theory of Hysteresis Losses. N. Akulov 3227
Magnetisation of Ferromagnetic Crystals. F. Bitter 3228
Interatomic Electrons in Crystal Lattices. R. Forrer 3229
Magnetism and Disturbances of the Crystal Lattice. X-Ray Investigations of α-Iron. F. Regler 3230
Thermomagnetic Hysteresis in Steel. W. Y. Chang and W. Band 3807
Magnetic Properties and Chemical Composition of Alloys. J. Dorfman 3815
Magnetic Properties of Electrolytic Iron. K. W. Grigorow 3816
Curves and Calculations of Permeability and Hysteresis Loss in Thin Laminæ. W. Arkadiew 3817
Demagnetisation of Iron and Nickel by H.F. Alternating Fields. S. Procopiu and N. Florescu 3818
Magnetic Permeability of Iron Wires in the Wave-Length Region of 46 to 1000 m. K. Kreielsheimer 3819
Irregularities in Magnetisation. K. J. Sixtus 3821
Magnetic Analysis of Internal Stresses. Part II. M. Kersten 3822
Polymorphic and Magnetic Transformations. H. Lange 3823
Magnetic and Dilatometric Research on Hardening of Steel. W. Jellinghaus 3824
Influence of Barkhausen Magnetisation Jumps on the Electrical Conductivity. D. S. Steinberg and F. Miroschnitschenko 4261
Magnetised Spheroid Immersed in a Permeable Medium. L. Page 4264
Heusler Alloys. S. Valentiner and G. Becker 4266
Magnetisation of Iron by Superposing an Alternating Field on a Constant Field. S. Procopiu 4267
Magnetic Hysteresis Created by Alternating Current Magnetisation. Edel-Agatha Neumann 4268
Absolute Saturation of Cubic Cobalt. R. I. Allen and F. W. Constant 4269
Frequency Dependence of Supraconductivity and Ferromagnetism. R. Sänger 4629

For the Key to this Index see pp. 1358 to 1372.

Magnetism and Electromagnetism, *continued.*

Abstract Nos.

Non-Existence of a Permeability Anomaly in Iron between Wave-Lengths 841–300 m. G. R. Wait 4670
Remanence of Single Iron Crystals. S. Kaya 4671
Theory of Ferromagnetic Powders and the Magnetic Susceptibility of Rocks. G. Grenet 5454
See also 764, 3223, 3809, 4265 *under* 1 ; 5072 *under* 3 ; 775 *under* 5 ; 394, 395, 779, 780, 784, 1216, 1217, 5465 *under* 6 ; 787, 1648, 3847 *under* 7.

3. Diamagnetism and Paramagnetism.

Modified Ionic States in Crystals. C. P. Snow and F. I. G. Rawlins 39
Variation of Principal Magnetic Susceptibilities of Certain Paramagnetic Crystals with Temperature. B. W. Bartlett 389
Magnetic Susceptibility of Binary Mixtures of Liquids. K. Kido 768
Theory of the Alteration in the Magnetism of Free Electrons Caused by Hydrostatic Pressure. T. Takéuchi 769
Diamagnetism and Paramagnetism of the Metals. E. Vogt 770
Moments of Paramagnetic Ions in Salt Solutions. H. Auer 771
Magnetisation of Paramagnetic Crystals in Alternating Fields. I. Waller 772
Diamagnetic Susceptibilities of Some Sulphur Compounds. J. Farquharson 773
Diamagnetism of Water at Different Temperatures. A. P. Wills and G. F. Boeker 1210
Magnetism of the Metallic Elements. E. Vogt 1211
Magnetic Susceptibilities of Some Paramagnetic Substances. W. Sucksmith 1212
Influences of Crystalline Fields on the Susceptibilities of Salts of Paramagnetic Ions. Part II. Iron Group. Especially Ni, Cr and Co. R. Schlapp and W. G. Penney 1213
New Photomagnetic Effect. D. M. Bose and P. K. Raha 1429
Nature of the Absorption Centres in Crystals and Solutions Containing Paramagnetic Ions. Mechanism of the Absorption. D. M. Bose and S. Datta 1430
Magnetic Moments of K and Li with Regard to their Nuclear Magnetic Moments. W. Meissner and H. Scheffers 1642, 2624
Paramagnetism of Dissolved Cobaltous Ion. R. Mercier 1643
Magnetic Susceptibility of Silicon-Rich Ferro-Silicons. C. Bedel 1644
Paramagnetic Properties of Crystals of the Rare Earths. Parts I and II. H. A. Kramers 1849, 5461
Susceptibility of Liquid Mixtures with a New Apparatus. L. Sibaiya and H. S. Venkataramiah 2057
Magnetic Susceptibility of Several Systems of Binary Alloys. Y. Shimizu 2058
Diamagnetic Susceptibility of Inorganic Compounds. Part III. Oxyacidic Salts and Chlorides. K. Kido 2059
Diamagnetic Susceptibility and Refraction According to Wave Mechanics. B. Mrowka 2060
Diamagnetic Susceptibilities of Mixtures of Substances having large Electric Moments. J. E. Garssen 2061
Susceptibility and Electrical Conductivity of Copper-Manganese Alloys. S. Valentiner and G. Becker 2062
Diamagnetism of Conducting Electrons. R. Peierls 2063, 2623
Physical Properties of Compounds of High Melting Point. K. Becker 2482
Diamagnetic Susceptibility of Helium. F. J. Wiśniewski 2615
Magne-Crystallic Action. Part I. Diamagnetics. K. S. Krishnan, B. C. Guha and S. Banerjee. Part II. Paramagnetics. K. S. Krishnan, N. C. Chakravorty and S. Banerjee 2616, 3825
Paramagnetic Constant of Metallic Rhenium. N. Perakis and L. Capatos.... 2617
Magnetic Susceptibilities of Lead, Silver and their Alloys. C. G. Montgomery and W. H. Ross 2618
Thermal and Magnetic Behaviour of Gadolinium Sulphate in the Temperature Range of Liquid Helium. N. Kürti 2619
Crystalline Fields of Pr, Nd and Yb from Paramagnetic Susceptibilities. W. G. Penney 2620
Theory of Diamagnetism for Mono- and Poly-Nuclear Systems. D. P. Ray-Chaudhuri 2621
Diamagnetism of Free Electrons. J. S. Mitchell 2622

Magnetism and Electromagnetism, *continued.*

Abstract Nos.
Lower Curie Point of Rochelle Salt. B. and I. Kurtschatow.............. 3183
Magnetic Properties of Liquid Ozone. P. Lainé.......................... 3231
Diamagnetism of Carbon Tetrachloride, Benzene and Toluene at Different Temperatures. G. F. Boeker.......................... 3232
Electric Properties of Isomorphous Crystals. M. Eremejew and B. Kurtschatow 3267
Paramagnetism and Magnetic Birefringence of Oxygen Gas and Liquid. L. Goldstein and Y. Rocard 3489
Influence of Magnetic Fields on the Heat Conductivity of Gases. Part I. H. Senftleben and J. Pietzner 3670
Magnetic Structure of an Iron Alum in Strong (Magnetic) Fields. J. Forrest.. 3826
Principal Magnetic susceptibilities of Some Paramagnetic Crystals at Low Temperatures. L. C. Jackson.......................... 3827
Electric Polarisability and Diamagnetic Susceptibility of Molecules. S. Bhagavantam 3828
Magnetic Susceptibilities of Hydro-Chloric Acid and Lithium Chloride Solutions. A. F. Scott and C. M. Blair, Jr.......................... 3829
Susceptibility of Paramagnetic Solutions. C. J. Gorter.......................... 3830
Diamagnetism of Water at Different Temperatures. B. Cabrera and H. Fahlenbrach 3831
Magnetic Moment of Samarium Oxide at Low Temperatures. E. C. Wiersma and B. H. Schultz 3832
Magnetic Moment of a Hydrogen Molecule. G. C. Wick 3833
Magnetic Moment of the Nitrogen Nucleus. R. F. Bacher.......................... 3834
Magnetic Susceptibilities of Common Gases. G. G. Havens.......................... 3835
Variation of the Magnetic Properties of Barium with Temperature. C. T. Lane.......................... 3836
Extremely Low Temperatures by Adiabatic Demagnetisation of Salt of Rare Earth. W. J. de Haas, E. C. Wiersma, H. A. Kramers, A. Cotton and A. d'Arsonval 4270
Magnetic Susceptibilities of Salts of the Iron Group by a Modification of Quincke's Method. H. Breternitz 4271
Diamagnetic Susceptibility of the Hydrogen Molecule. K. Honda and T. Hirone 4672
Diamagnetism and Temperature. B. Cabrera and H. T. Fahlenbrach...... 4673
Paramagnetism and Chemical Union. E. Rabinowitsch.......................... 4674
Paramagnetism and the Molecular Field of Neodymium. P. W. Selwood.... 4675
Magnetic Properties of Substances with Artificial Anisotropy. W. König 4676
Magnetic Tests of Artificial Anisotropy in Celloidin, Agar-Agar and Celluloid. K. Weisel 4677
Paramagnetic Saturation of Potassium Chromic Alum. C. J. Gorter, W. J. de Haas and J. van den Handel 5070
Magnetic Behaviour of Chromic Compounds at Low Temperatures. C. J. Gorter, W. J. de Haas and J. van den Handel.......................... 5071
Magnetic Properties of Metals at Low Temperatures. W. J. de Haas and P. M. van Alphen 5072
Magnetic Properties of Iodine in Different Solvents. S. S. Bhatnagar and C. L. Lakra 5073
Susceptibilities of Paramagnetic Solutions. E. Vogt.......................... 5074
Magnetic Deviation of Hydrogen Molecules and the Magnetic Moment of the Proton. Part I. R. Frisch and O. Stern. Part II. I. Estermann and O. Stern 5075, 5076
Magnetic Moment of a Rotating Hydrogen Molecule. G. C. Wick.......... 5077
Magnetic Deviation of Oxygen Molecules. R. Schnurmann.......................... 5078
Magnetic Study of Single Electron Bindings in Compounds of the Type of Tellurium Dimethyl Dihalide. S. S. Bhatnagar and T. K. Lahiri...... 5079
Susceptibility of MnO as a Function of the Temperature. R. W. Tyler...... 5455
Influence of Temperature on the Diamagnetism of Liquids. M. A. Azim, S. S. Bhatnagar and R. N. Mathur.......................... 5456
Susceptibility of Electrolytically Charged Palladium-Hydrogen Alloys. B. Svensson 5457
Susceptibility of Paramagnetic Solutions. G. Foëx 5458
Susceptibility of Oxygen Gas. E. C. Wiersma and C. J. Gorter.......... 5459
Susceptibility of Argon. W. Gerlach.......................... 5460
See also 764, 2009 *under* 1; 3224, 3225, 5453 *under* 2.

For the **Key** to this Index see pp. 1358 to 1372.

Magnetism and Electromagnetism, *continued.*

4. Electromagnetic Field and Electrodynamics.

Abstract Nos.

Establishment of a Homogeneous Magnetic Field. A. Bühl and F. Coeterier 390
Magnetic Field of a Solenoid Oscillating at Radio Frequency. O. Stuhlman, Jr., and S. Githens, Jr. 391
Ritz's Electrodynamic Theory. W. Hovgaard 1214
Electromagnetic Fields due to Variable Electric Charges and the Intensities of Spectrum Lines According to the Quantum Theory. G. A. Schott 1645
Uncertainty Relations and Volume of Photons. D. Meksyn 2218
Nature of Electrodynamic Forces. G. Eibenschütz 2626
New Relations in Electromagnetism and their Interpretation. F. Prunier 2627
Dirac's New Theory of the Electromagnetic Field. S. Schubin 2787
Electromagnetic Field of a Moving Electrified Sphere and its Radiationless Orbits. G. A. Schott 3222
Definition of Magnetic Field. H. Abraham 3233
Electromagnetic Equations. F. Prunier 3234
Integration of the Equations of Maxwell-Hertz for Uniaxial Crystalline Media. A. Tonolo 3837
Theory of Gravitation and Electromagnetism. H. P. Soh 3945
Electromagnetic Fields due to Variable Electric Charges and the Intensities of Spectrum Lines according to the Quantum Theory. V. Fock 4678
Motion of Lines of Induction. G. Darrieus 5080
H.F. Magnetic Field of a Flat Spiral Coil. S. Githens, Jr., and O. Stuhlman, Jr. 5081
Models of the Electric Field and of the Photon. J. J. Thomson 5462
See also **3808** *under* **1; 3838** *under* **5; 1648, 2633** *under* **7.**

5. Electromagnetic Induction. Inductance.

Bearing of Earth's Permeability on Self- and Mutual Inductance by Coils Wound on its Surface. W. F. G. Swann 392
Significance of the Sign of Mutual Inductance. R. R. Nimmo and H. D. Poole 393
Passage of an Alternating Current through a Ferromagnetic Wire under Torsion. G. Valle 774
After-Effect Losses in Ferromagnetic Materials with Weak Alternating Fields. R. Goldschmidt 775
System Equivalent to a System of two Circuits Coupled Inductively. C. Rimini 776
Control of Ignition-Coil Discharge Characteristics. G. I. Finch and R. W. Sutton 2628
Change in Magnetic Inducation of Fe-Ni Alloys Due to Cold Working and Recovery therefrom by Heating. G. Tammann and H. J. Rocha 2629
Molecular Orientation of Molecules with Permanent Moment in an Alternating Field. Application of the Dispersion of the Dielectric Constant and the Kerr Effect. Y. Rocard 3483
Faraday's Law as a Basis of Electromagnetic Theory. H. B. Phillips 3838
Unipolar Induction. L. Slepian 3839
New Formulæ for the Calculation of Self- and Mutual Induction of Coaxial Circular Coils in Terms of Arithmetico-Geometrical Scales. L. V. King 3840
Use of Arithmetico-Geometric Mean Series for the Calculation of Elliptic Integrals, with Special Reference to the Calculation of Induction. F. W. Grover 3841
Mutual Inductance of any Two Coaxial Single-Layer Coils. F. W. Grover 4272
Comparison of the Mutual Inductance between two Coils with the Self-Inductance of one of them. H. Mukherjee 4607
Simple Frequency Bridge. R. M. Davies 4608
Magnetic After-Effect. P. C. Hermann 4679
Extension of a Maxwell Mutual-Inductance Formula to Apply to Thick Solenoids. H. B. Dwight and S. H. Chen 4680
Determination of a Mutual Inductance in Terms of the Self-Inductance of its Components. L. M. Chatterjee 5000
Attraction Between Coils in the Rayleigh Current Balance. C. Snow 5463
Induction Coil Discharges. W. McFarlane 5464
See also **2056** *under* **1; 766, 2612, 4267** *under* **2; 390, 5080** *under* **4; 544, 3845, 4684, 5084** *under* **7.**

Magnetism and Electromagnetism, *continued*.

6. Magneto-Mechanical Effects (Gyromagnetic Effect and Magnetostriction).

Abstract Nos.
Effect of Strain on Magnetostriction and Magnetisation in Nickel. C. W. Heaps ... 394
Magnetostriction and Magnetisation of Single Crystal of the Iron-Nickel Series. F. Lichtenberger ... 395
Magnetostriction Oscillator Producing Intense Audible Sound and Some Effects Obtained. M. Gaines ... 678
Quantitative Valuation of the Matteucci Effect. H. Ostermann and F. v. Schmoller ... 777
Induction Effect at the Ends of a Twisted Ferromagnetic Wire. W. Schütz 778
Magneto-Mechanical Effect. N. Akulov and E. Kondorsky ... 779
Effect of Elastic Strain on the Magnetisation Curve. N. Akulov, A. Helfenbein and N. Byczkov ... 780
Magnetostriction of Iron-Cobalt Alloys. Y. Masiyama ... 781
Tension/Extension Diagram of Ferromagnetic Materials for Very Small Loads. H. Kühlewein ... 782
Joule Magnetostrictive Effect in Cobalt-Iron Alloys. S. R. Williams ... 783
Torsional Magnetisation. H. Brion ... 784
Elastic Tension and Magnetic Properties. R. Becker ... 1215
Permeability and Hysteresis by Magnetisation in the Direction of Applied Tension. F. Preisach ... 1216
Properties of Homogeneously Distorted Cubic Ferromagnetic Lattices. F. Bitter ... 1217
Cross-Sectional Effect of Magnetostriction. W. Fricke ... 1646
Theory of Galvanomagnetic and Galvanoelastic Effects. N. Akulov ... 2055
Magnetostriction of Ferromagnetic Crystals. R. Gans and J. v. Harlem ... 2630
Influence of the Intensity of Magnetisation upon the Modulus of Elasticity and Damping of Natural Vibrations of Ferromagnetic Materials. O. v. Auwers ... 3235
Influence of Elastic Extension of Ferromagnetic Material at the Curie Point. M. N. Michejew ... 3236
Magnetostriction. A. Schulze ... 3842
Magnetostriction of Nickel-Cobalt Alloys. Y. Masiyama ... 4273
Magnetisation and Magneto-Resistance. N. G. Alocco ... 4681
Gyromagnetic Experiments on the Process of Magnetisation in Weak Fields. S. J. Barnett ... 4682
Gyromagnetic Effects: History, Theory and Experiments. S. J. Barnett 4683
Elasticity of Ferromagnetic Materials. M. Kersten ... 5140
Mechanostriction and ΔE Effect. N. Akulov and E. Kondorsky ... 5465
See also 1205, 3228, 3822 *under* 2.

7. Apparatus and Technique.

Consequences of the Classical Deviation Theory. H. Meldau ... 544
Distribution of Mass in Marine Compasses ... 545
Vibration Galvanometer Independent of Frequency. W. Meissner and U. Adelsberger ... 785
Resonant Shunt Damping in Oscillographs. E. J. Martin and D. F. Caris ... 786
Reversing and Short-Circuiting Switch for Hysteresis Measurements. A. W. Smith ... 787
Brownian Movement Limits for Series of Observations. F. Zernike ... 884
New Methods for Magnetic Measurements upon Thin Metallic Strips. P. C. Hermann ... 1648
Vibration Galvanometer Independent of Frequency. W. Meissner and U. Adelsberger ... 2064
Magnetic Method for Measurement of Thicknesses. P. Bricout ... 2198
Apparatus for Measuring the Magnetic Properties of Rocks. G. Grenet ... 2285
Apparatus for Measurement of the Earth's Magnetic Field. L. F. Bates ... 2303
Electrical and Magnetic Measurements. G. Keinath ... 2631
Magnetic Balance for the Inspection of Austenitic Steel. R. L. Sanford ... 2632
Measurement of Small Electrodynamic Forces with the Condenser Microphone. A. Agricole ... 2633
Damping and Resonance with an Einthoven String Galvanometer. A. H. Bebb 2634
Magnet for α-Ray Spectroscopy. J. D. Cockcroft ... 2932

Magnetism and Electromagnetism, *continued*.

Abstract Nos.

Apparatus for Magnetic Testing at High Magnetising Forces. R. L. Sanford and E. G. Bennett 3237
Compact Electromagnet for General Purposes. L. F. Bates and B. J. Lloyd-Evans 3238
Principles of Construction of Magnetic Compasses. M. Tenani 3843
Theory of Moving-Coil Oscillograph. Rousseau 3844
Demonstration of Eddy Currents in Conductors of Various Shapes. D. Brown 3845
Modified Torsion Balance for Magnetic Measurements. J. Dorfman and I. Kikoin 3846
New Method of Estimating Magnetic Atomic Moments. J. Dorfman 3847
Energy Loss Testing of Magnetic Materials Utilising a Single Strip Specimen. C. Dannatt 4684
Determination of the Magnetic Properties of Laminated Rings. H. Kühlewein 4685
Magnetic Flux Recorder. O. v. Auwers 4686
Astatic Magnetometer. E. Thellier 5082
Electromagnetic Balance. D. S. Ainslie 5083
Measurement of Very Small Inductances. Cecil L. Fortescue 5084
Thermal Wattmeter. B. A. Sharpe 5094
See also 388, 766, 767, 1209, 1640 *under* 2 ; 1210, 1429, 2057, 2058, 2618, 3827, 5070 *under* 3 ; 390 *under* 4 ; 2628, 5000, 5463, 5464 *under* 5 ; 783, 784, 1216 *under* 6.

8. Unclassified.

Experimental Test of Quantisation in Direction. R. Frisch and E. Segrè 1749
Analogy between Mechanical and Electrical Systems. F. A. Firestone 2520
Rapid Variations of Scalar Potential in Space. R. P. J. P. del Pulgar 4074
Effect of Magnetic Field and of Temperature on the Specific Heats of Gases. T. Okamura 4962
Influence of a Magnetic Field on the Dielectric Constants of Argon and Oxygen. H. Voss 5034

Mass (Standards, Measurements, Apparatus).

1. Standards.
2. Apparatus and Measurements.

Cross-References :
Units, *see* Mathematical Methods, etc., 3.

1. Standards.

Precision Weights. J. J. Manley 4362

2. Apparatus and Measurements.

New Sensitive Balance for Smallest Weights. W. W. Loebe and R. Kühn .. 1329
Rod Rider for High Precision Balance. L. Ramberg 5163

Mathematical Methods. Theory of Measurements. Units and Dimensions.

1. Mathematical Methods.
2. Theory of Measurements, Probability and Errors.
3. Units and Dimensions.
4. Apparatus and Technique.
5. Unclassified.

1. Mathematical Methods.

Tables of the Elliptic-Cylinder Functions. E. L. Ince 80
Expansion for Laplacean Integrals in Terms of Incomplete Γ-Functions. E. C. Molina 81
Physics and Method of Coincidences. W. Bender 82
X-Ray Analysis of Iron Pyrites by Fourier Series. H. M. Parker and W. J. Whitehouse 435
Numerical Solution of Stability Problems. A. F. Cornock 456
Applications of Prolate Spheroidal Harmonics. (Miss) D. M. Wrinch 470
New Representation of Geometrical Crystallography. B. Delaunay 841
Polydromes of the Newtonian Potential of a Family of Homogeneous Bodies. R. Wavre 888
Practical Application of Periodogram Analysis. J. W. Sandström 889
Inverted Prolate Spheroids. (Miss) D. M. Wrinch 1198

Mathematical Methods. Theory of Measurements. Units and Dimensions, *continued*.

Abstract Nos.
Applications of the Absolute Differential Calculus to Physics. C. Kaplan.... 1331
Extension of the Methods of Heaviside's Calculus in the Calculation of (Electrical) Circuits Containing Parameters Varying with Time. J. Neufeld.... 1577
Complex Tensor Equations in the Two-Dimensional Theory of Structures. A. Busemann 1736
Equipotential Family of Plane Curves. S. Higuchi.......... 1737
Graduation of Data by the Orthogonal Polynomials of Least Squares. A. C. Aitken 1738
Method for Interpolating Data, Based on Dühring's Rule. J. H. Perry and E. R. Smith 1739
Finite Rigid Displacements. U. Cisotti.......... 1744
Value of the Spherical Function and Its Derivation for the Most Important Terrestrial Magnetic Observatories. G. Fanselau 1827
Tangential Polar or Pedal Coordinates, and Their Application. M. Jacob.... 2199
Interpolation Without Differences. R. T. A. Innes.......... 2200
Nomogram with Circular Guides. S. Gradstein 2201
New Method for the Exact Calculation of the Fourier Coefficient. G. Dietsch and B. Rotzeig 2769
Graphical Method for the Integration of Emden's Equation. J. Dick 2770
Equations with Hamiltonians Dependent on Time, and Resonance Phenomena in Wave Mechanics. J. Winter 2793
Successive Approximations by the Rayleigh-Ritz Variation Method. J. K. L. MacDonald 2796
Action at a Distance in Electricity. H. Abraham 3213
Simple Method for the Numerical Solution of Differential Equations. W. G. Bickley 3342
Calculation of Statistical Averages for Perturbed Systems. R. Serber 3343
Euler-Savary Formula. R. S. de Beires.......... 3352
Method of Spectral Reduction in Classical Dynamics. A. Khintchine 3353
Semi-Continuity of Enclosure of the Trajectories of Dynamics. Marie Charpentier 3354
Geometry of Degenerate Heat Families. A. Fialkow.......... 3669
Use of Arithmetico-Geometric Mean Series for the Calculation of Elliptic Integrals, with Special Reference to the Calculation of Induction. F. W. Grover 3841
Ellipsoidal Functions and Their Application to Some Wave Problems. E. T. Hanson 3918
Four-Place Table of sin x/x. J. Sherman 3927
Fermat's Principle. L. Natanson 3928
Mathematical Methods for Computing Thermodynamic Functions from Spectroscopic Data. L. S. Kassel 4123
Space-Time Scale as a Quantum Coordinate System. W. Bender 4363
Integral Equation of Physical Geodesy. N. Idelson 4810
Heaviside's Calculus. K. T. Vahlen 5068
Calculation of Characteristic Values for Periodic Potentials. H. D. Koenig.... 5164
Generalised Propagation Representing Waves or Moving Particles. A. Buhl.. 5165
Transition from Wave Equation to Heat Conduction Equation. W. Tschen.. 5362
See also 4352 *under* 2; 1333, 1741, 1742, 2205, 3347 *under* 4.

2. Theory of Measurements, Probability and Errors.

Theory of Errors and Least Squares. H. Jeffreys.......... 83
Summation Methods in Smoothing Curves. F. Vercelli.......... 890
Indeterminacy in Quantum Mechanics. J. Solomon.......... 1339
Concepts of Inverse Probability and Fiducial Probability Referring to Unknown Parameters. R. A. Fisher.......... 1740
Statistical Hypotheses. J. Neyman and E. S. Pearson.......... 2202
Method of Least Squares. A. S. Eddington.......... 2203
Probability and the Exponential Laws of Physics. M. C. Holmes.......... 2204
Gauss' Proof of the Normal Law of Errors. H. Jeffreys.......... 2771
Extremely Simple Method of Periodogram Analysis. D. Alter.......... 2772
Theory of the Representation of Errors of the Third Order. H. Schwerdtfeger 2998
Probability, Statistics and the Theory of Errors. H. Jeffreys.......... 3344
Sources of Error in Statistical Analysis. A. G. McNish.......... 3345
Graphical Representation of Two-Dimensional Stress Distributions. V. Tesar 4352

Mathematical Methods. Theory of Measurements. Units and Dimensions, *continued.*

Abstract Nos.
Mechanical Adjustment of Observations by Least Squares. B. Germansky.. 4773
Probability and Chance in the Theory of Statistics. M. S. Bertlett.......... 4774
Nets of Triangles Consisting of Points with Circular Error-Curves. J. M. Tienstra 4811
Rapid Adjustment of Observations in Network of Geophysical Stations by the Method of Least Squares. E. Lancaster-Jones...................... 4815
Estimation of Tenths on a Scale. H. Bäckström........................ 5162
" Spread " as a Measure of Deviation in Physical Measurements. E. Q. Adams 5166
Theory of Probability. C. W. Oseen 5167
Experimental Investigation of Probability. A. L. Clark.................... 5168
Application of Probabilities to the Counting of α-Particles. N. I. Adams, Jr... 5247
See also 3352 *under* 1.

3. Units and Dimensions.

Three Superflous Systems of Electromagnetic Units. G. A. Campbell 788
Temperature and the Principle of Similitude. A. Busemann............. 1948
C.G.S. Magnetic Units. A. E. Kennelly 2625
Adoption of the Absolute System of Electrical Units of Measurement. L. Lombardi 3174
Magnetic Definitions from the Circuital Standpoint. A. E. Kennelly........ 3808

4. Apparatus and Technique.

Probable Error of the Slide Rule. D. L. MacAdam......................... 84
Slide Rule for Use with a Polarisation Photometer. M. Richter............. 198
Determination of the Constants of a Polar Planimeter. P. Werkmeister...... 471
New Galton Apparatus for the Solution of the Partial Equations $\Delta U=O$ and $\Delta U=C$. F. Bernstein.. 891
Amsler's Planimeter. J. Colomb.. 1330
Determination of " Average Particle Size " from the Screen-Analysis of Non-Uniform Particulate Substances. T. Hatch.......................... 1332
New Calculating Apparatus with Logarithmic Scales. R. Ravigneaux...... 1333
Theory of the Oscillation Measurer. H. W. Koch and W. Zeller............ 1716
Nomographs for the Complex Roots of Quadratic and Reduced Cubic Equations. P. Luckey.. 1741
Kinematic Analysis of some Mathematical Instruments. W. Meyer zur Capellen 1742
Electro-Mechanical Determinant Machine. A. Weygandt..................... 2205
Weber-Kern Planimeter. G. Grüss.. 2206
Partial Reversal of the Smoothing due to Measuring Instruments. Ellen Gschwind and W. Lohmann...................................... 2773
Electrical Calculating Machine. R. R. M. Mallock......................... 3346
New Logarithmic Calculating Machine. H. Fuss............................ 3347
Logarithmic Protractor. H. J. Yearian................................... 3348
Machine for dividing Scales of Varying Increment. Bettine M. Davies...... 4775
Mathematical Transformation of the Set-Square index Nonogram. H. J. Allcock.. 5169

Mechanics, Classical.

1. Statics.
2. Dynamics.
3. Statistical Mechanics.
4. Apparatus and Measurements.
Cross-References :
Acceleration due to Gravity, *see* Gravitation, 2.
Astronomical Dynamics, *see* Dynamical Problems (Astronomical).
Atomic and Molecular Rays, *see* Kinetic Theory of Matter, 3.
Cross-References (contd.) *:*
Elastic Vibrations, *see* Elasticity and Plasticity, 6, *and* Acoustics, 1.
Hydrodynamics and Aerodynamics, *see under.*
Kinetic Theory, *see* Kinetic Theory of Matter.
Wave Motion, *see* Elasticity and Plasticity, 6, *and* Seismology.

1. Statics.

Calculation of Wind Stresses in High Building Frames. F. Takabeya...... 472
Transcendental Equation in Statics. F. Tricomi.......................... 1743

Mechanics, Classical, *continued*.

Abstract Nos.

Many-Valued Potential Functions. R. Wavre........................ 2207
Applications of the Theorem of Three Moments. V. Belfield.............. 2208
Lagrangian in Quantum Mechanics. P. A. M. Dirac........................ 2216
Theorem of Three Moments in General Form. F.Y.Tsai 3311
Reciprocal Relation for Linear Systems. A. Bloch........................ 3312
Funicular Surface. L. Lecornu........................ 3349
Lines of Force of Symmetric Newtonian Potentials. I. Opatowski.......... 3350

2. Dynamics.

Momentum Relations in Crossed Fields. L. Page........................ 130
Forces Varying Inversely as any Function of the Distance. M. Kiveliovitch 473
Dynamical Applications of Stieltjès Integral. G. Bouligand........ 474
Motion of Rigid Systems in a Space of *n* Dimensions. C. Agostinelli........ 475
Motion of a Deformable Body which Remains Similar to Itself. Part II. Instantaneous Centre of Velocity. M. Pascal 476
Effect of Air Resistance on the Deviation of Falling Weights. B. Giannelli.. 477
Rotary Oscillation of a Long Circular Cylinder in a Viscous Fluid. H. F. Winny 478
Particular Cases in the Problem of Three Bodies. M. Kiveliovitch.......... 479
Function in Quantum Mechanics Corresponding to a Given Function in Classical Mechanics. N. H. McCoy 482
Space-Structure and Motion. G. Strömberg 493
Isochronism of Pendulums. J. Haag........................ 501
Variable Rotation of an Elastic Solid. L. Lecornu 1309
Principle of Reciprocity Applied to Mechanical Vibrations. A. Steinheil.... 1311
Sensitive Elastic Pendulum: Contribution to Gravity Survey of France. F. Holweck 1316
Variational Principles and Dissipative Systems. J. L. Synge.............. 1334
Accelerations of the Points of a Rigid System in Plane Motion. G. Merlo.... 1335
Rapidly Oscillating Pendulums in Liquids. A. Krebs and H. Landsberg 1336
Finite Rigid Displacements. U. Cisotti........................ 1744
Collisions in the Problem of Three Bodies. M. Kiveliovitch.............. 1745
Group-Velocity for Waves Associated with Phenomena. B. Finzi.......... 1751
Lattice Regions and Their Application in Dynamics. C. H. Dix.......... 2209
Displacement of an Ennuple and a New Interpretation of Ricci's Coefficients of Rotation. P. Dienes 2210
Analytical Nature of Solutions of Canonical Systems Integrable by Quadratures. G. Lampariello 2211
Geometrical Interpretation of Mechanical Systems. G. Vranceanu.......... 2212
Differential Equations of Ballistics. C. A. Clemmow........................ 2213
Kowalewski's Top in Quantum Mechanics. O. Laporte.............. 2217
Variable Parameters and Asymptotic Prevision in Some Problems of Celestial Mechanics. G. Krall 2252
Combustion Problem of Internal Ballistics. A. D. Crow and W. E. Grimshaw 2501
Analogy between Mechanical and Electrical Systems. F. A. Firestone.... 2520
Magnetisation of Invar Pendulums. E. C. Bullard........................ 2744
Problem of *n* Bodies Mutually Attracting as Any Power of the Distance. M. Kiveliovitch 2774
Problem of *n* Bodies with Variable Masses. M. Mandes........................ 2775
Forces of Inertia of a System and Relative Motion. Saintillan............ 2776
Integration of Canonical Systems of One Degree of Freedom. G. Lampariello 2777
Reduction of Order of Canonical Systems. R. Einaudi........................ 2778
Equation of Motion of Dynamical Systems. T. Boggio........................ 2779
Motion of Surfaces, Curves and Points Associated with Groups of Waves. B. Finzi........................ 2780
Gyroscopic Movement of Stable Projectiles. R. d'Adhémar 2781
Percussion in Wires. H. Pailloux 2782
Combustion Problem of Internal Ballistics. A. D. Crow and W. E. Grimshaw 3114
Maximum Force of Impact of a Body on the Surface of Water. F. Trey.... 3328
Generalisation of Euler's Theorem on Brachystochrone Movements. C. Carathéodory 3351
Euler-Savary Formula. R. S. de Beires........................ 3352
Semi-Continuity of Enclosure of the Trajectories of Dynamics. Marie Charpentier 3354

For the Key to this Index see pp. 1358 to 1372.

Mechanics, Classical, *continued*.

Abstract Nos.
Quantum Mechanics of the Anharmonic Oscillator. G. Pöschl and E. Teller 3360
Problem of Two Bodies with Variable Masses. W. Markowitz 3400
Problem of Two Bodies with Decreasing Mass. E. Merlin 3401
Limitations of Values of Adiabatic Invariants and Problems of Variable Mass. D. Graffi 3402
Curves of Constant Pressure. M. Haimovici 3929
Geodesic Curvature of the Dynamical Trajectories of Holonomic Systems. E. Gugino 3930
Oscillations of Frictionally-Coupled Oscillatory Systems. E. Hahnkamm 3931
Fundamental Formula of the Kinematics of a Rigid Body. Luisa Pelosi 4364
Homogeneous Variables in Classical Dynamics. P. A. M. Dirac 4365
Hamiltonian Principle in Point Mechanics. Fundamentals of the Super-Quantification Method. J. L. Destouches 4366
Basic Conceptions of Wave Mechanics. L. Flamm 4374
Two Theorems on Energy Exchange in Collisions. A. Bloch 4776
See also 2785 *under* 4.

3. Statistical Mechanics.

Relativity Correction to Maxwell's Law of Distribution of Velocities. A. Busemann 73
Concept of Causality. M. Planck 97
Planck and the Principle of Causality in Physics. A. Ferguson 98
Symmetry of the Benzene Molecule. V. Deitz and D. H. Andrews 1260
Application of Boltzmann's Principle to Certain Kinds of Movement. G. I. Pokrowski 1386
Asymptotic Expansions of the Expressions for the Partition Function and the Rotational Specific Heat of a Rigid Polyatomic Molecule for High Temperatures. Irene E. Viney 1533, 4589
Statistics of Continuous Systems and Temporal Course of Physical Processes. M. Leontowitsch 2214
Classical Statistics and Quantum Mechanics. R. Fürth 2225
Proof of Canonical Distribution within Part of a System. G. Krutkow 2498
Mathematical Foundation of Statistical Mechanics. A. Khintchine 2783
Metrically Transitive System. W. Seidel 2784
Method of Spectral Reduction in Classical Dynamics. A. Khintchine 3353
Calculation of Mean Brownian Area. A. Kolmogoroff and M. Leontowitsch 4361
Origin of a Canonical System. L. S. Ornstein and W. R. van Wijk 4980
Theory of Probability. C. W. Oseen 5167
Amplitude of Non-Harmonic Vibrations. J. P. den Hartog 5170
General Properties of Resonance in Non-Linear Mechanics. N. Kryloff and N. Bogoliùboff 5171
Causality and Physics. R. Hönigswald 5173

4. Apparatus and Measurements.

Measurement of Small Changes of Length. R. Mohr 78
Hydrodynamical Demonstration of Gyrostatic Forces. J. Jaumann 85
Apparatus to Demonstrate the Nature of Centrifugal Force. G. Mayr 480
Recording the Falling Time of Bodies. R. M. Bowie 903
New Calculating Apparatus with Logarithmic Scales. R. Ravigneaux 1333
Kinematic Supports and Clamps. L. R. Wilberforce 1337
Theory of the Oscillation Measurer. H. W. Koch and W. Zeller 1716
Centrifuge without Axle but of Great Stability and High Angular Velocity. P. Girard and C. Chukri 1746
Gyroscopic Tops and Combinations. J. G. Gray 2215
Theory of the Reduction of Acceleration Date. R. L. Edwards 2785
Accelerometer with Rolling Contact. F. Charron 2786
Photographic Recording of Oscillatory Motion. E. Raetsch 3355
Measurement of Mechanical Resistances by Rotatory Motions. E. Paolini 4367
Photographic Recording Accelerometer. P. Libessart 4777
Ultracentrifuge. J. W. Beams, A. J. Weed and E. G. Pickels 5119
See also 2208 *under* 1.

Mechanics, Quantum.

1. Matrix (or Symbolic) Mechanics.
2. Wave Mechanics.
3. Statistical Mechanics.
4. Experimental Determination of "*h*."

Cross-References:
Special Applications, *see* Atomic and *Cross-References* (contd.): Molecular Structure; Electrons, Positrons and Protons; Radiation, General Theory; Radioactivity; Spectroscopy; Thermodynamics; X-Rays.

1. Matrix (or Symbolic) Mechanics.

Abstract Nos.
Quantum Mechanics of the Water Molecule. A. S. Coolidge 8
Dirac's Equation in General Relativity. G. C. McVittie 86
Dirac's New Field Theory. S. Schubin 87
Extension of the Dirac Operators in Quantum Mechanics. T. Iwatsuki and Y. Mimura 88
Equivalence of Corpuscular and Wave Interpretations of Negative Electricity in Quantum Theory. R. Einaudi 89
Atomic Eigenfunctions and Energies. C. W. Ufford and G. H. Shortley 91
Theory of Electric Charge. A. S. Eddington 92
Einstein and Mayer's Theory and Dirac's Equations. J. Solomon 101
Unitary Field Theory. J. A. Schouten and D. van Dantzig 102
Unitary Field Theory and Dirac's Equation. J. A. Schouten and D. van Dantzig 103
Unitary Field Theory. J. A. Schouten and D. van Dantzig 104
Calculation of the Quantum Defect for Highly Excited S States of Para- and Ortho-Helium. L. P. Smith 248
Electromagnetic Field of a Light Wave. L. de Broglie 481
Function in Quantum Mechanics Corresponding to a Given Function in Classical Mechanics. N. H. McCoy 482
Quantum Theory of the Diffusion of Electrons. L. Goldstein 758
Conservation of Momentum in the Processes of Electronic Impacts. L. Goldstein 759
Physical Principles of the Quantum Theory. G. Temple 892
Free Electrons in a Crystalline Lattice. Wave Equation and Magnetic Properties. L. Brillouin 893
Indeterminacy in Quantum Mechanics. J. Solomon 1339
Multiplication of Quantum-Mechanical Quantities. P. Jordan 1340
Interaction between Atoms with *s*-Electrons. N. Rosen and S. Ikehara 1341
Unitary Field Theory and Dirac's Equations. W. Pauli and J. Solomon 1345
Wigner's Extension of the Thomas-Kuhn Summation Law for an Electron in a Central Field. H. A. Kramers, C. C. Jonker and T. Koopmans 1493
Analogy between Equations of the Quantum Theory and Maxwell's Equations. M. Fahmy 1638
Theory of Electron Spin. S. Shimasaki 1747
Wentzel Approximation Process in the Relativity-Dynamics of the Electron. K. Bechert 1748
Experimental Test of Quantisation in Direction. R. Frisch and E. Segrè 1749
Quasi-Mechanic Solution of the Quantum-Mechanic Wave Equation. O. Klein 1750
Calculation of Matrix Elements for Lewis Electronic Structures of Molecules. L. Pauling 2114
Lagrangian in Quantum Mechanics. P. A. M. Dirac 2216
Kowalewski's Top in Quantum Mechanics. O. Laporte 2217
Uncertainty Relations and Volume of Photons. D. Meksyn 2218
Group Theory of Valency States. S. C. Kar 2219
Quantum Mechanics of Seven and Eight Electrons with Spin Degeneracy. H. Eyring and G. E. Kimball 2220
Variable Scale Atomic Wave Functions. J. P. Vinti and P. M. Morse 2221
Atomic Wave-Functions Expressed in Terms of Momenta. W. Elsasser 2222
Quantum Theory in General Relativity. V. Bargmann 2226
Semi-Vectors and Spinors. A. Einstein and W. Mayer 2227
Theory of Diamagnetism for Mono- and Poly-Nuclear Systems. D. P. Ray-Chaudhuri 2621
Dirac's New Theory of the Electromagnetic Field. S. Schubin 2787
Operational Theory of the Dirac Wave Equation. S. Gupta 2788
Spatial Quantisation. R. Frisch and E. Segrè 2789

Mechanics, Quantum, ***continued.***

Abstract Nos.

Exchange Energy. V. Fock ... 2790
Vector Model and the Pauli Principle. M. H. Johnson, Jr. ... 2791
Almost Closed Shells. M. H. Johnson, Jr. ... 2792
Quantum Theory of Inelastic Electron Collisions. L. Goldstein ... 3019
Geometry of Four Component Spinors. O. Veblen ... 3371
Theory of Spinors. K. Nikolsky ... 3372
Electron Spin and Theory of the Neutron. W. Wessel ... 3474
Magnetic Interaction of a Valence Electron with Inner Shells. M. H. Johnson, Jr., and G. Breit ... 3934
Theory of the Exchange Problem and of Ferromagnetism at Low Temperatures. C. Møller ... 4265
Generalisation Possibilities of the Formalisms of Quantum Mechanics. P. Jordan ... 4368
Geometry of Spinors. G. Mie ... 4369
Maxwell's and Dirac's Equations. K. Nikolsky ... 4370
Dirac's and Schrödinger's Equations. T. Levi-Civita ... 4371
Wave Equation of the Electron in the General Relativity Theory. L. Infeld and B. L. van der Waerden ... 4372
Interpretation of Dirac's Wave Functions. Probability and Determinism. F. Pounier ... 4373
Dirac Equations in the Case of Semi-Vectors. A. Einstein and W. Mayer ... 4783
Fission of the Most Natural Field Equations for Semi-Vectors into Spinor Equations of Dirac Type. A. Einstein and W. Mayer ... 4784
Calculation of Characteristic Values for Periodic Potentials. H. D. Koenig ... 5164
Molecular Symmetry and the Reduction of the Secular Equation. H. Eyring, A. A. Frost and J. Turkevich ... 5172
See also 483, 484, 1755, 3358, 3939 *under* 2 ; 2225 *under* 3.

2. Wave Mechanics.

Analytic Atomic Wave Functions. J. C. Slater ... 90
Energy of the Configuration $(1s)^2(2s)$. K. Ochiai ... 93
Five-Electron Problem in Quantum Mechanics and Its Application to the Hydrogen-Chlorine Reaction. G. E. Kimball and H. Eyring ... 94
Asymptotic Integration of the Differential Equation Relating to the Thomas-Fermi Atom. A. Sommerfeld ... 95
Quantum Mechanics. P. Ehrenfest ... 96
Vibrations of Polyatomic Molecules. N. Rosen and P. M. Morse ... 249
Magnetic Moment and Moment of Rotation of the Electron. L. de Broglie ... 379
Approximation of Geometric Optics as Applied to a Dirac Electron Moving in a Magnetic Field. O. Laporte ... 483
Sauter's Method for the Solution of the Dirac Equation without Particularising the Operators. K. Bechert ... 484
Wentzel-Brillouin Eigenvalue Calculations. E. Fues ... 485
Experimental Demonstration of the Effects of Coupling of Harmonic Motions, as Illustrating Phenomena in Quantum Mechanics. A. C. Burton ... 486
Inelastic Collisions of Fast Electrons. O. Klemperer ... 757
Calculation of the Terms of the Optical Spectrum of an Atom with one Series Electron. J. McDougall ... 1047
Theory of Metals. Part I. A. H. Wilson ... 1166
Interchange of Vibrational and Translational Energy. C. Zener ... 1324
Self-Consistent Fields and Free Electrons in Metals. Part III. L. Brillouin 1338
Applications of the Method of Impact Parameter in Collisions. E. J. Williams 1342
Relativistic Theory of Particles with Arbitrary Intrinsic Momentum. E. Majorana ... 1343
Repulsion Exponents of Alkali Hydrides. A. Krebs ... 1507
Group-Velocity for Waves Associated with Phenomena. B. Finzi ... 1751
Application of Riemannian Geometry of Complex Space to Wave-Mechanical Problems. U. Kakinuma ... 1752
Corpuscular Mechanics. F. J. de Wisniewski ... 1753
Mechanical Theory of Wave Mechanics and Quantum Mechanics. A. Korn ... 1754
Foundation of the Electron Wave Equation. S. R. Milner ... 1755
Higher Ionisation Potentials of Atoms According to the Thomas-Fermi Model. A. Sommerfeld ... 1756
Application of Quantum Mechanics to Chemical Kinetics. R. P. Bell ... 1957

For the Key to this Index see pp. 1358 to 1372.

Mechanics, Quantum, ***continued.***

Abstract Nos.

Quantum Mechanics and Chemistry with particular Reference to Reactions Involving Conjugate Double Bonds. H. Eyring 1958
Stopping Power of Matter for Swiftly Moving Charged Particles. F. Bloch .. 2045
Diamagnetic Susceptibility and Refraction According to Wave Mechanics. B. Mrowka 2060
Model of Diatomic Rotator with Two Degrees of Freedom. L. Simons and E. H. Smart 2109
Electron and Proton Spin Moments and Their Possible Orientations Derived from the Quantum Dynamical Relativity-Invariant Differential Equation of the Many-Body Problem. H. Seyfarth 2223
Superquantisation and Mechanics of Abstract Space. J. L. Destouches...... 2224
Wave Functions for the Ground State of Lithium and Three-Electron Ions. E. B. Wilson, Jr. 2416
Constitution of Metallic Sodium. E. Wigner and F. Seitz 2673
Motion of Surfaces, Curves and Points Associated with Groups of Waves. B. Finzi.. 2780
Equations with Hamiltonians Dependent on Time and Resonance Phenomena in Wave Mechanics. J. Winter 2793
Wave-Mechanics as Hamiltonian Mechanics in Function-Space. C. Lanczos 2794
Application of the Method of Phase-Integrals to the Hydrogen Ion. E. M. van Engers and H. A. Kramers.. 2795
Successive Approximations by the Rayleigh-Ritz Variation Method. J. K. L. MacDonald 2796
Wave-Mechanical Theory of Refraction. J. A. Wasastjerna................ 2797
Electron Distribution in Atoms and Ions. J. A. Wasastjerna.............. 2798
Wave-Mechanical Significance of the Apparent Radii of Atoms and Ions. J. A. Wasastjerna 2799
Forces between Atoms and Ions. J. A. Wasastjerna....................... 2800
Quantum Mechanics and Sophus Lie's Theory of Finite and Continuous Groups. J. Mariani 2801
Quantum Mechanics of Diatomic Systems. M. Born and S. Flügge.......... 2802
Schrödinger's Wave Equation. G. D. Birkhoff............................ 2803
Probability of the Presence of the Electron According to Wave Mechanics. U. Crudeli 2804
Wave Mechanics Model of the Neutron. S. Flügge......................... 2926
Theory of Metals. R. Peierls.. 3158
Crystal Optics and Wave Mechanics. G. Wentzel.......................... 3296
Penetration of Electrons into the Region of Negative Energy Values. S. Szczeniowski 3356
Theory of Scattering by a Force Centre. E. H. Kennard.................. 3357
Conservation of Probability and Energy as Criteria for the Validity of Wave Equations. A. Lees 3358
Theory of Perturbation and the Eigenvalue Problem of an Anharmonic Oscillator. K. Basu 3359
Quantum Mechanics of the Anharmonic Oscillator. G. Pöschl and E. Teller 3360
Relativistic Two-Body Problem. O. Scherzer.............................. 3361
Extension to Wave-Mechanical Theory. T. Zaycoff........................ 3932
Boundary Conditions for the Wave Equation. W. H. McCrea and R. A. Newing 3933
Normal State of the Hydrogen Molecule. S. Weinbaum..................... 3935
Calculations of Atomic Wave Functions. Part I. Survey and Self-Consistent Fields for Cl^- and Cu^+. D. R. Hartree................................3936
Charge Distributions in Fluorine and Neon. F. W. Brown.................. 3937
Has the Negative Energy Spectrum an Influence on Nucleus Phenomena. G. Beck 3938
New Presentation and Interpretation of the Quantum Equations. H. T. Flint 3939
Free Paths and Transport Phenomena in Gases and the Quantum Theory of Collisions. Part I. Rigid Sphere Model. H. S. W. Massey and C. B. O. Mohr 3940
Scattering of Neutrons and Protons. E. Wigner 4041
Quantum Mechanics of Chemical Reactions Involving Conjugate Double Bonds. H. Eyring, A. Sherman and G. E. Kimball...................... 4166
Basic Conceptions of Wave Mechanics. L. Flamm.......................... 4374
Extension to Wave-Mechanical Theory. R. Zaycoff........................ 4375
Treatment of the Stark Effect by the Methods of the Perturbation Theory. W. v. Koppenfels 4536

Mechanics, Quantum, *continued.*

Abstract Nos.
Self-Consistent Field for Bound Electrons: Supraconductivity. L. Brillouin 4627
Effect of Exchange on the Scattering of Slow Electrons from Atoms. P. M. Morse and W. P. Allis 4664
Virial Theorem and Molecular Structure. J. C. Slater 4721
Dirac's Equation for the Many-Electron Problem and Multiplet Structure. M. Hayakawa 4778
Hamiltonian Dynamics of Function Space. C. Lanczos 4779
Quantisation of Kramers and Pauli Model. P. M. Davidson 4780
Theory of Radiation. J. Solomon 4907
Passage of Positive Ions Through Gases. H. S. W. Massey and R. A. Smith 5009
Generalised Propagation Representing Waves or Moving Particles. A. Buhl 5165
Integral Theory of Field and Matter. R. Zaycoff 5177
Characteristic Values of the Two Minima Problem and Quantum Defects of *f* States of Heavy Atoms. Ta-You Wu 5322
Quantum Mechanics and Overvoltage. R. W. Gurney 5431
See also 86, 87, 92, 481, 758, 759, 893, 1747, 1748, 1750, 2226, 2621, 2788, 2790, 4371, 4372, 4373, 5164 *under* 1; 1757, 2047, 3362 *under* 3.

3. Statistical Mechanics.

Concept of Causality. M. Planck 97
Planck and the Principle of Causality in Physics. A. Ferguson 98
Statistical Mechanics with Particular references to the Vapour Pressures and Entropies of Crystals. R. H. Fowler and T. E. Sterne 99
Vapour Pressure Constant of Methane. T. E. Sterne 673
Asymptotic Expansions of the Expressions for the Partition Function and the Rotational Specific Heat of a Rigid Polyatomic Molecule for High Temperatures. Irene E. Viney 1553, 4589
Some Inquiries Concerning Quantum Mechanics. W. Pauli 1757
Simple Derivation of the Dissociation Formula. D. H. Menzel 1787
Thermodynamic Properties of the H^1H^2, H^2H^2 Molecules and Compounds Containing the H^2 Atom. H. C. Urey and D. Rittenberg 1966
Scattering of Similar Particles. T. Sexl 2047
Diamagnetism of Conducting Electrons. R. Peierls 2063
Classical Statistics and Quantum Mechanics. R. Fürth 2225
Theory of Thermal Conduction at Low Temperatures. W. Kroll 2471
Transport Phenomena in Einstein-Bose and Fermi-Dirac Gases. Part I. E. A. Uehling and G. E. Uhlenbeck 2496
Diamagnetism of Free Electrons. J. S. Mitchell 2622
Mathematical Foundation of Statistical Mechanics. A. Khintchine 2783
Calculation of Statistical Averages for Perturbed Systems. R. Serber 3343
Validity of the Virial Law in the Thomas-Fermi Theory. H. Jensen 3362
Relativistic Treatment of the Fermi Atom. H. Jensen 3363
Quantum Statistics of Almost Classical Assemblies. J. G. Kirkwood 3364
New Statistics and Electrostatics. M. K. Gopalaiengar 3806
Statistics of Diatomic Gases. K. Széll 3941
Statistical Theory of Low-Frequency Intermolecular Forces. J. G. Kirkwood 3942
Atom as a Space-Time Quantum System. G. Beck 4385
Coefficients of Absorption and Opacity of a Partially Degenerate Gas. Bertha Swirles 4407
Rotational Specific Heat of a Polyatomic Molecule for High Temperatures. Correction. Irene E. Viney 4589
Application of Statistical Mechanics to the Theory of Turbulent Fluid Motion. J. M. Burgers 4765
Rôle of Kinetic Electron Energy in Inter-Atomic Forces. H. Hellmann 4719
Causality and Physics. R. Hönigswald 5173
See also 4373 *under* 1; 3940 *under* 2.

4. Experimental Determination of "*h*."

Most Probable Values of *e*, *e*/*m* and *h*. K. Shiba 378, 4250
Most Probable Values of the Atomic Constants *e* and *h*. R. Ladenburg 2044

Medical Radiology and Electrology.

1. Electrobiology.
2. Electrotherapy.
3. Radiography.
4. Radiotherapy :
   - (*a*) Infra-Red Rays.
   - (*b*) Ultra-Violet Rays.

4. Radiotherapy (*contd.*) :
   - (*c*) X-Rays.
   - (*d*) Radioactive Radiations.

5. Unclassified.

Cross-References :
Industrial Radiography, *see* X-Rays, 11.

1. Electrobiology.

Abstract Nos.

Classification of Ions in Natural Chemical Grouping According to their Vaso-Motive Action in Respect to Trans-Cerebral Electrolysis. G. Bourguignon and S. Eliopoulos 789
Ionisation of the Atmosphere and its Biological Effects. L. R. Koller 1218
E.M.F.'s Developed in the Human Subject when in Contact with Metallic Conductors. F. Vlès, Anna Grossman and Madeleine Gex 2635
Calculations Relating to the Electrical Transport of Material in the Living Organism. R. Fürth 3239
Biological Effects of E.H.F. Electromagnetic Radiation. J. W. Schereschewsky 3246
Physico-Mathematical Aspects of Nerve Conduction. N. Rashevsky 4687
Kathode-Ray Oscillogram of Action Potential of Nerve. S. Watanabe and K. Sasagawa 5466
Effects of A.C. upon Cutaneous Sensory Thresholds. I. M. Thompson 5467
Pathology of Death by Electrocution. A. Zimmern 5468
See also 1843 *under* 4 (*d*).

2. Electrotherapy.

Universal Precision Stimulator. O. H. A. and F. O. Schmitt 396
Short-Wave H.F. Currents. Their Heating Effects—Short-Wave Diathermy. H. H. U. Cross 790
Action-Current as a Measure of Muscle Contraction. R. H. Stetson and H. D. Bouman 2065
Physical Conditions Relating to the Laws of Electrical Excitation of Nerve and Muscle. A. Strohl 2066
Method of Outlining Cutaneous Nerve Areas. I. M. Thompson and V. T. Inman 2067
Registrations with Ångström's Pyranometer. Parts I and II. E. Hasché 3422
Measurement of Heat Production in Diathermy. A. Hemingway and J. F. McClendon 5085
Use of H.F. Electric Fields to Raise Body Temperature. W. E. Curtis and S. F. Evans 5469
Production and Use of H.F. Currents in Medicine. Réchou, Halphen and Auclair 5470
Measurement of H.F. Current in Medical Applications. A. Laquerrière and L. Pariseau 5471
D'Arsonval's Contribution to L.T. Electrotherapy. G. Bourguignon 5472
See also 1218 *under* 1.

3. Radiography.

Investigation of the Gaseous Decomposition Products of X-Ray Films. Grace Ballard 1649
New and Rapid Intensifying Screen. L. Levy and D. W. West 2068
New Intensifying Screen. N. S. Finzi 2069
Anti-Diffusion Filters. R. Imbert 3240
Application of Thin-Film Resistances to the Measurement of Voltage and Power in X-Ray Tubes. G. W. Bowdler 3241
New Fluorescent Screen for Visual Examinations. L. Levy and D. W. West 4274
X-Ray Stereoscopy. H. R. Jarre and O. E. W. Teschendorf 4688
X-Ray Shutter with a Simple Timing Device. W. Binks 5086
Physical Foundations of Chest Roentgenography. Parts I and II. R. B. Wilsey 5473

4. Radiotherapy.

(*a*) *Infra-Red Rays.*

Intensity and Spectral Distribution of Solar Radiation in New Orleans. H. Laurens and H. S. Mayerson 2876
Transmission of Infra-Red Radiation through the Horny Layer of Human Skin. A. R. Pearson and R. E. Norris 4689

Medical Radiology and Electrology, ***continued.***

Abstract Nos.

(*b*) *Ultra-Violet Rays.*
Ultra-Violet Solar Radiation Measurements. W. W. Coblentz, R. Stair and J. M. Hogue 1650
Photochemical Considerations in the Action of Ultra-Violet Light on the Human Skin. W. Frankenburger 2070
Investigation of Ultra-Violet Radiation. L. Zehnder 2071
Erythemal Measurement of Ultra-Violet Radiation. A. H. Taylor 2072
Intensities of Visible and Ultra-Violet Radiation in Sunlight. W. Kunerth and R. D. Miller 2636
Action of Ultra-Violet Radiation on Aqueous Solutions of Gelatin. P. Ponthus 2687
Transmission of Light by a Flexible Unit of Quartz. H. Dejust and E. Perrin 3242
Fundamental Units and Terms for Biologically-Effective Radiation. M. Luckiesh and L. L. Holladay 4275
Hydrogen Ultra-Violet Lamp. O. Darbyshire 4953
See also 2876 *under* 4 (*a*).

(*c*) *X-Rays.*
Applied Effective Voltage and X-Ray Emission. L. S. Taylor, G. Singer and C. F. Stoneburner 397
H.T. Voltmeter for the Direct Measurement of Tube Voltage during Diagnosis and Therapy. K. W. Müller 791
Quantum Physics of Biological X-Ray Action. R. Glocker 792
X-Ray Machine Outputs and Influence of Wave-Form on Quality of X-Radiation. C. E. Eddy 1219
Measurement of L.T. X-Ray Intensities. L. S. Taylor and C. F. Stoneburner 1220
Absorption Curves and Spectra of X-Ray Beams. A. Mutscheller 1525
Transient Peak kV and R Output from an Air-Cooled Therapy Tube. M. J. Gross 1651
Experimental Clinical Research Work with X-Ray Voltages above 500 kV. A. Soiland 2073
Advantages and Disadvantages of Small-Chamber Measuring Instruments. H. B. Hunt 2074
H.T. Porcelain X-Ray Tube. R. Crane and C. C. Lauritsen 2453
Operation of Thick-Walled X-Ray Tubes on Rectified Potentials. L. S. Taylor and C. F. Stoneburner 2637
Relative Effects Produced by 200-kV and 700-kV X-Rays and γ-Rays. Distribution of Radiation in a Water Phantom. G. Failla, E. H. Quimby, L. D. Marinelli and J. E. Rose 2638
Relative Effects Produced by 200-kV and 700-kV X-Rays and γ-Rays. Comparison Based on Effects on Iodides, Eder's Solution and Photographic Film. H. Q. Woodward, E. H. Quimby and H. R. Downes. Comparison Based on Effects on Drosophila Eggs and on Wheat Seedlings. P. S. and C. T. Henshaw and D. S. Francis. Comparisons Based on Biological Changes Produced in Mammalian Tissues with 200-kV X-Rays and γ-Rays. H. J. Bagg and C. R. Halter. Comparison Based on the Production of Erythema in Human Skin. J. J. Duffy, R. F. McNattin, M. M. Copeland and E. H. Quimby. Comparison Based on Clinical Observations. R. F. McNattin. Correlation of Experimental Results. G. Failla 2639, 2640, 2641, 2642, 2643, 2644
Valve-Operated Time-Switch. W. R. Gray 2645
500-kV X-Ray Therapy Unit. W. E. Schall 2646
New Radiographic Technique Employing the "Rotalix" Tube. H. Franke 2647
International Comparison of the Röntgen—The Unit of Quantity of X-Rays. G. W. C. Kaye and W. Binks 2648
Value of a Multi-Perforated Screen in Deep X-Ray Therapy: Preliminary Report on a New Method of Delivering Multiple Erythema Doses without Permanent Injury to the Skin. F. Liberson 2649
Simple Integrating Dosage Measuring Instrument. A. Mutscheller 2650
Quality Determination of X-Rays: Half Value Layer as a Practical Method of Estimating the Quality of X-Rays. W. H. Meyer 3243
H.T. Generators for X-Ray Apparatus. E. H. W. Banner 3641
Comparison of H.T. X-Ray Generators. L. S. Taylor and K. L. Tucker 3642
Measurements of High-Voltage X-Rays. W. V. Mayneord and J. E. Roberts. 3656
Skin Erythema Dose in Terms of Roentgens, in Superficial Therapy. G. C. Andrews and C. B. Braestrup 3849
Effect of X-Rays and γ-Rays Upon the Eggs of Drosophila Melanogaster. O. Glasser and F. R. Mautz 3850

Medical Radiology and Electrology, *continued.*

Abstract Nos.
Recent Progress and Recent Status of Radiology. A. C. Christie 3851
Change in Definition Occurring with the Bucky Diaphragm of the Mobile Type. W. W. Fray and W. T. Hill 3852
Influence of Filtration on Surface and Depth Intensities of 200-kV X-Rays. Edith H. Quimby and L. D. Marinelli 4690
Standardisation of X-Ray Dosage by Means of Methylene Blue. W. Stenstrom and Anne Lohmann 4691
Advantages and Disadvantages of Large Chamber Measuring Apparatus. A. K. Merchant 4692
X-Ray Output Comparisons of Therapy Circuits and Tubes. M. J. Gross and Z. J. Atlee 4693
Comparison of X-Rays Generated by Voltages of Different Wave-Form. L. S. Taylor, G. Singer and C. F. Stoneburner 4956
Comparison of H.T. X-Ray Tubes. L. S. Taylor, G. Singer and C. F. Stoneburner 4957
Direct Measurement of X-Ray Tube Voltage. F. D. Owen-King 4958
Experimental Realisation of the Röntgen. G. W. C. Kaye and W. Binks 5087
Progress in the Design and Manufacture of X-Ray Tubes. M. J. Gross and Z. J. Atlee 5349
Genealogy of X-Rays. O. Glasser 5474
Energy Considerations in High-Voltage Therapy. C. C. Lauritsen 5475
Changes in Susceptibility of Drosophila Eggs to X-Rays. P. S. Henshaw and C. T. Henshaw 5476
Determination of High Potentials and High Potential Wave Forms. P. Kirkpatrick 5477
Depth Dose Calculations for Super-Voltage X-Rays. M. A. Tuve 5478
Recommendations of the Third International Congress of Radiology Relating to Protection from X-Rays and Radium. L. S. Taylor 5481
See also 5479 *under* 4 (*d*).

(*d*) *Radioactive Radiations.*
Radiotherapy with Long-Continued Feeble γ-Radiation. J. Joly 1221
Radium as a Therapeutic Agent. Lee of Fareham 1652
Production and Application of Fast Corpuscular Rays (Artificial Disintegration of Atoms). A. Brasch 1843
Effect of Radon on Cell Growth. A. Foà 3244
New Electroscope for Hospital Use. L. G. Grimmett 3245
Biological Response to γ-Rays of Radium as a Function of the Intensity of Radiation. F. G. Spear and L. G. Grimmett 4276
Effect of γ-Rays on the Metabolism of Tissue in Culture. Barbara E. Holmes 4694
Retention of Radon in the Human Body. Maria R. Deinlein 5088
Evaluation of Depth Doses of γ- and X-Rays. W. J. Rees and L. H. Clark 5479
Three Problems of γ-Ray Therapy. W. V. Mayneord 5480
Whole Animal Exposure to Highly Filtered γ-Rays. W. G. Whitman 5482
See also 2638, 2639, 2640, 2641, 2642, 2643, 2644, 3850, 3851, 5481 *under* 4 (*c*).

5. Unclassified.

Radiological and Electrotherapeutic Departments of the St. Louis Hospital and the Laennec Hospital, Paris. L. Vellard 398
Magnetostriction Oscillator Producing Intense Audible Sound and Some Effects Obtained. N. Gaines 678
Diffusion of Visible and Ultra-Violet Light by Human Skin. T. Kofman 2075
Factors Affecting the Ratio of Adsorption of Radium-B and Radium-C on Nickel. J. A. Cranston and C. Benson 2315
Light and Life. N. Bohr 2651
Atmospheric Electricity and Föhn Sickness. W. S. van Leeuwen, J. Booij and J. van Niekerk 2909
Radioactivity of Well Waters from Dumfries. J. Muir 2916
Heating Effects in Porous Bodies due to Short Waves. H. Bordier 3848
Electrocardiograph Incorporating a Valve Amplifier and a Thompson-Type Industrial Oscillograph. J. Priore 4277
Ultra-Violet Rays in Industry. M. J. Dorcas 4278
Viscosity Changes Produced in Protoplasm by Radiations from Radioactive Substances. Nora Feichtinger 4695

Melting and Boiling Points.

1. Melting Points.
2. Boiling Points.
3. Relations of M. Pt. and B. Pt. and other Physical Properties.
4. Liquefaction and Solidification.
5. Evaporation and Condensation.
6. Apparatus and Technique.
7. Unclassified.

Cross-References :
Standard Fixed Points, *see* Temperature, Measurement of, 1.
Thermodynamic Theory, *see* Thermodynamics, 3 and 5.

1. Melting Points.

Abstract Nos.
Fusion Curve of Hydrogen up to 610 kg./cm.^{2} W. H. Keesom and J. H. C. Lisman ... 289
Equation of the Melting Curve. J. J. van Laar ... 290
Thermodynamics of Concentrated Solutions. Part II. Crystallisation Curves in Binary Eutectic Systems. E. Kordes ... 302
Influence of Cold Working on the Temperature of the Commencement of Grayglow. G. Tammann, F. Neubert and W. Boehme ... 577
Liquid Nitrobenzol near the Melting Point. J. Wellm ... 650
Fusion under Pressure. E. Jänecke ... 651
X-Ray Investigation of Normal Paraffins Near Their Melting Points. A. Müller ... 821
Quantum Theory of Latent Heat. H. C. Kudar ... 1116
Activity Coefficient of Potassium Chloride. H. M. Spencer ... 1182
Purification and Physical Properties of Organic Compounds. Part I. Heating and Cooling Curves. Part II. Melting Points. E. L. Skau 1940, 3680
Fusion Curves for the Systems Ammonia-Propyl Alcohols and Ammonia-Butyl Alcohols. H. P. Cady and Ethel A. Jones ... 2478
Freezing Points of Solutions of Nitrobenzene in Benzene and Cyclohexane, and their Relations to the Electrical Polarisation. L. G. Davy and N. V. Sidgwick ... 2479
Specific Heat, Melting Point and Latent Heat of Fusion of Hydrogen Fluoride. J. Dahmlos and G. Jung ... 3663
Freezing Temperature of Silver. W. F. Roeser and A. I. Dahl ... 3682
Thermal Properties of Alloys by the Difference Method. E. Alberti ... 4155
Annealing of Glass as a Physical Problem. L. H. Adams ... 4156
Freezing Point of Iridium. F. Henning and H. T. Wensel ... 4158
Melting-Curve of Neon to 200 kg./cm.^{2} W. H. Keesom and J. H. C. Lisman 4972
Melting Point of Carbon Tetrachloride in Relation to its Thermal Pre-treatment. W. E. Nieuwenhuis ... 4973
See also 1944, 1945, 1946 *under* 3 ; 1121, 4963 *under* 6.

2. Boiling Points.

Distribution Coefficient of Hydrogen Fluoride over the Binary System (H_2O-HF) at 25° C, and the Boiling-Point Curve of the System at Atmospheric Pressure. K. Fredenhagen and Marianne Wellmann ... 1136
Apparatus for Determination of Dew Point and Boiling Point of Mixtures of Volatile Liquids. L. Gay and J. Soulié ... 2480
Solubilities, Conductivities, and Boiling-Point Elevations of Inorganic and Organic Compounds in Liquid Hydrogen Fluoride. K. Fredenhagen (with G. Cadenbach and W. Klatt) ... 3085
Determination of the Molecular Elevation of Boiling Point in Hydrogen Fluoride. K. Fredenhagen and G. Cadenbach ... 3086
Azeotropic Hydrobromic Acid Solutions at Pressures of 100 to 1200 mm. W. D. and L. G. Bonner and F. J. Gurney ... 3087
Action of Radon on Unsaturated Hydrocarbons. Part III. G. B. Heisig .. 3463
See also 3088 *under* 3.

3. Relation of M. Pt. and B. Pt. and other Physical Properties.

Total and Specific Heats of a Series of Fractions of Petroleum, and their Relation to Other Properties. Parts IX-XII. H. R. Lang and R. Jessel 275
Effect of Particle Size of Substances on their Melting Points. N. Schoorl ... 291
Symmetry of the Benzene Molecule. V. Deitz and D. H. Andrews ... 1260
Melting Point Depressions of Borneol and Camphoroxine. T. S. Patterson, Janet H. Blackwood and J. McW. Stewart ... 1539
Cryoscopic Studies on the Transition Points of Compounds of Organic Compounds with Salts. H. Oosaka ... 1941

Melting and Boiling Points, *continued.*

Abstract Nos.

Cryoscopy of Paraldehyde, Acetone and Ether in Solutions of Ammonium and Magnesium Sulphates. F. Bourion and (Miss) O. Hun 1942
Cryoscopic Rules and Dipole Theory. W. Fischer 1943
Freezing Points of Binary Mixtures of Ethyl Alcohol and Ethyl Ether. A. Lalande 1944
Errors in Binary Freezing-Point Diagrams. E. L. Skau and B. Saxton 1945
Freezing-Point/Solubility Relations of Geometrical Isomers. Part II. E. L. Skau and B. Saxton 1946
Boiling-Point Elevation of Concentrated Milk Solutions. A. W. Scott 2481
Physical Properties of Compounds of High Melting Point. K. Becker 2482
Application of Henglein's Equation to Solutions and Mixtures. V. Kirejew 3088
Cryoscopic Effects in Mixed Solvents and Their Relation to the Solubility of Added Substances. O. Anders 3089
Influence of Intensive Desiccation on Physical Properties of Benzene. A. W. C. Menzies and D. A. Lacoss 3117
Activity Coefficient of Nitric Acid. F. Hartmann and P. Rosenfeld 3190
Cryoscopic Determination of Hydration of Ions in Solution. F. Bourion, E. Rouyer and (Miss) O. Hun 3198
Cryoscopic Determination of the Hydration of Ions of Potassium Chloride. F. Bourion and E. Rouyer 3199
Cryoscopic Determination of Hydration of Ions of Sodium Chloride. F. Bourion and (Miss) O. Hun 3200
Cryoscopic Determination to Hydration of Ions of Ammonium Chloride. F. Bourion and E. Rouyer 4249
See also 1940, 2479, 3680, 4156 *under* 1; 3085, 3086, 3087 *under* 2; 1121 *under* 6.

4. Liquefaction and Solidification.

Adhesive Forces on Solidification. A. Sellerio 1761

5. Evaporation and Condensation.

Influence of Ventilation on the Readings of a Wet-Bulb Thermometer. H. Bongards 973
Vaporisation Phenomena in Mercury Particles. A. Lustig and M. Reiss 1190
Maximum Rate of Evaporation of Water. T. Alty 1538
Vapour-Pressure Measurements of BaO, SrO, CaO and Their Mixtures. A. Claassen and C. F. Veenemans 1567
Lecture Demonstration of Gas Liquefaction. H. Keefer 1122
Process of the Production of Vapour. K. Schreber 1938
Effect of High Electrostatic Fields upon the Vaporisation of Molybdenum. G. B. Estabrook 1939
Helium Liquefaction Plant at the Clarendon Laboratory, Oxford. F. A. Lindemann and T. C. Keeley 1947
Apparatus and Methods for Precise Fractional-Distillation. W. J. Podbielniak 2483
Computation of Distillation Apparatus for Hydrocarbon Mixtures. E. W. Thiele and R. L. Geddes 2484
Energy Exchange at a Platinum-Hydrogen Interface. H. H. Rowley and K. F. Bonhoeffer 3075
Velocity of Evaporation of Liquids in a Current of Air. M. Centnerszwer, (Miss) C. Wekerôwna and Z. Majewska 3677
Condensation of Mercury on a Vertical Wall. R. Risch 3678
Theory of the Psychrometer. Part I. Mechanism of Evaporation. Part II. Effect of Velocity. J. H. Arnold 3679, 4578
Theory of the Rate of Sublimation. S. Miyamoto 4154
Surface Energy and Evaporation of Droplets. Dorothy J. Woodland and E. Mack, Jr. 4579
Volatilisation from Potassium Oxide-Silica Glasses. E. Preston and W. E. S. Turner 4580
Vapour Tension of BaO, SrO and CaO and their Mixtures Deduced from Measurements of the Rates of Evaporation. E. Preston 4596
Increase of the Concentration of H^1H^3 by Fractional Evaporation and Rectification. W. H. Keesom, H. van Dijk and J. Haantjes 4718
Relations between Friction, Heat-Transition and Evaporation. W. Findeisen 4971
Evaporation of Atoms, Ions and Electrons from Caesium Films on Tungsten. J. B. Taylor and I. Langmuir 5093

Melting and Boiling Points, *continued*.

Abstract Nos.
Evaporation and Diffraction of Volatile Materials into an Inert Gas Stream. E. Preston 5369

6. Apparatus and Technique.

New Cryoscopic Method. A. Lalande 1121
Calorimeter for Heats of Fusion. F. D. Rossini 4963
See also 4972 *under* 1; 2480, 3086 *under* 2; 1122, 1947, 2483, 2484 *under* 5.

7. Unclassified.

Phenomena Occurring in the Melting of Metals. W. L. Webster 3681

Meteorology.

1. Constitution of the Atmosphere at Various Levels. The Ozone Layer.
2. Temperature and Radiation.
3. Dynamical Meteorology (Pressure, Wind, Turbulence, Weather Maps and Forecasting).
4. Rain, Snow, Dew, Cloud, Fog, Moisture, Dust.
5. Climatology.
6. Optical Phenomena (Aurora, Night Sky, Corona, Halo, etc.).
7. Meteorological Instruments.
8. Unclassified.

Cross-References:
Aurora, *see also* Terrestrial Electricity and Magnetism, 2.
Cosmic Rays, *see* Radiation, Emission, 5.
Electrical and Magnetic Phenomena, *see* Terrestrial Electricity and Magnetism.
Solar Radiation, *see* Sun, 4.
Visibility, *see also* Vision, 2.

1. Constitution of the Atmosphere at Various Levels. The Ozone Layer.

Determination of Atmospheric Ozone by Visual Photometry. J. Gauzit 530
Photometric Study of Partial Lunar Eclipse of 14th Sept., 1932. F. Link 923
Brief Review of the Physics of the Upper Atmosphere. J. Bartels 959, 2286
Variations in the Density and the Oxygen Content of Atmospheric Air. A. Stock, H. Ramser and G. Eyber 1303
Photometric Theory of Lunar Eclipse. F. Link 1369
Physics in Meteorology. G. C. Simpson 1387
Attempt to Demonstrate the Presence of Neutrons in the Atmosphere. W. Meissner and K. Steiner 1422
Atmospheric Radioactivity. G. Aliverti 1424
Atoms, Molecules and the Atmosphere. S. Chapman 2891
Rapid Visual Photometric Method for Studying Atmospheric Ozone. J. Gauzit 4002
See also 986, 3443 *under* 6.

2. Temperature and Radiation.

Temperature of the Auroral Region Determined by the Rotational Series of the Negative Nitrogen Bands. L. Vegard 152
Radiation in the Atmosphere. D. Brunt 153
Effect of Radiation on Surfaces of Humidity Discontinuity. S. L. Malurkar 531
Inversions of Lapse-Rate of Temperature over Karachi. A. S. Hariharan 962
Effective Radiation of Heat from the Sky During the Day in Relation to Solar Altitude and degree of Obscurity of the Atmosphere. E. G. Meyer 2892
Thermal Balance of a Water Drop in the Atmosphere and the Effect of Radiation on the Upper Atmospheric Layers. C. S. Durst 2893
Temperature of the Atmosphere at Levels Accessible to Air-Waves. F. J. W. Whipple 2894
Maximum Day Temperatures and the Tephigram (*tø* Diagram). E. Gold 2895
Vertical Distribution of the Temperature of the Air in the First Two Metres Above the Ground. P. Seltzer 3436
Use of Glass Colour Screens in the Study of Atmospheric Depletion of Solar Radiation. H. H. Kimball and I. F. Hand 3991
Radiothermic Economy of Fields of Snow and Glaciers. J. Devaux 4003
Transformations of Energy in the Atmosphere. D. Brunt 4820
Adiabatic Lapse-Rate for Dry and Saturated Air. D. Brunt 4821
See also 1387, 2286, 2891 *under* 1; 532, 963 *under* 3; 1809 *under* 4; 2289, 2900, 2901, 4009, 4010, 4011 *under* 5; 1812 *under* 6; 975 *under* 7.

Meteorology, *continued*.

3. Dynamical Meteorology (Pressure, Wind, Turbulence, Weather Maps and Forecasting).

Abstract Nos.
Measurement of Small Changes of Length. R. Mohr 78
Origin of Anticyclones. C. E. P. Brooks 155
Semi-Diurnal Oscillation of the Barometer. L. de Marchi 532
Formation of Local Thunderstorms. Part II. Processes in the Free Atmosphere above Lindenberg on 2nd and 3rd July, 1932. H. v. Ficker 533
Air Masses in the Troposphere. M. Bossolasco 960
Some Characteristics of the Tropopause and Upper Troposphere over N.W. India. N. K. Sur and J. C. Roy 961
Daily Barometric Pressure and Temperature Variation in the Free Atmosphere and in the Mountain Valleys. A. Wagner 963
Variations of Annual Means of Atmospheric Pressure. H. Arctowski and J. Teśla 964
Thermodynamics of the Atmosphere. A. Refsdal 965
New Sort of Wind-Rose. N. Shaw and L. G. Garbett 1389
Katabatic Winds in a Valley. G. S. P. Heywood 1390
General Theory of Turbulent Friction and of the Interchange. H. Ertel 2287
Pilot-Balloon Sounding and Gradient Winds. P. Berger 2896
Breakdown of Steep Wind Gradients in Inversions. C. S. Durst 2897
Atmospheric Electricity and Föhn Sickness. W. S. van Leeuwen, J. Booij and J. van Niekerk 2909
Direction and Velocity of Wind in the Vicinity of a Wind Tower. H. Arakawa 3437
Diurnal Barometric Oscillation as an Effect of a Surface Wave and a New Method to Determine the Diffusivity of Air in Free Atmosphere. H. Arakawa 3438
Harmonic Analysis of the Atmospheric Pressure Oscillation in Europe in the Winter 1925-1926. L. Steiner 3439
Development in a Pressure System. G. Dedebant 3440
Beaufort Scale in Simple Formulæ and Rules for Memorising. O. V. Johansson 3441
Kinematics and Dynamics of Stable Atmospheric Vortices. J. Letzmann 4004
Intrusion of Air into Anticyclones. C. S. Durst 4005
Kinematical and Dynamical Properties of the Field of Pressure with Application to Weather Forecasting. S. Petterssen 4006
Long-Period Weather Forecasting. S. Evjen 4007
New Proof of the Hydrodynamic Circulation Theorem. H. Ertel 4015
Variation Principle of Atmospheric Dynamics. H. Ertel 4016
Electric Potential Gradient and Atmospheric Pressure. R. Guizonnier 4020
Diurnal Waves of Atmospheric Pressure, Computed from Observations made on Cruise VII of the Carnegie. Katharine B. Clarke 4421
Leonid Meteors of 1932. C. P. Olivier 4794
Calculations of Meridional Exchange-Coefficients. H. Lettau 4822
Development of Gradient Winds. H. Arakawa 4823
Variations in the Structure of Winds over Different Surfaces. C. S. Durst 4824
Variations of Wind Direction in the British Isles since 1341. C. E. P. Brooks and Theresa M. Hunt 4825
Removal of Heavier Air on a Sloping Surface and Theory of Stationary Air Currents. A. Defant 4826
See also 962 *under* 2; 1809, 4827 *under* 4; 975 *under* 7.

4. Rain, Snow, Dew, Cloud, Fog, Moisture, Dust.

Size of Fog Droplets. M. Kinoshita and K. Uchiyama 156
Effect of Humidity on the Velocity of Supersonic Waves in Air. M. Kinoshita and C. Ishii 313
Determination of Humidity by the Psychrometer. E. Genberg 966
Clouds. P. Gamba 968
Electrical Conductivity and Atmospheric Condensation Nuclei during a Voyage to Greenland. C. Maurain and J. Devaux 984
Ratio of the Number of Uncharged Nuclei to Number of Charged Nuclei of One Sign. C. O'Brolchain 987
Smoke Particles and Condensation Nuclei at Kew Observatory. H. L. Wright 1391
Variations in Potential Gradient Caused by Some Meteorological Phenomena. J. M. Sil 1402

Meteorology, *continued*.

Abstract Nos.

Cloud Formation in Consequence of Pressure Changes in a Temperature Field. O. Dengel 1809
Dust Motion in Electric Fields. S. Franck 2288
Influence of Atmospheric Suspensoids upon the Earth's Electric Field. H. L. Wright 2297
Number of Charged and Uncharged Condensation Nuclei in Town and Mountain Air. P. F. Schachl 2300
Growth of Silver Thaw. Y. Kodaira 2898
Mean Values of Relative Humidity at Different Heights in the Atmosphere over England. L. H. G. Dines 2899
Clouds in the Stratosphere. C. Störmer 3442
Aerial-Earth Current. Parts I, II and III. H. Noto 3453, 4430, 4836
Influence of Condensation Nuclei and Dust Particles on Atmospheric Ionisation. P. J. Nolan 3454
Size of Dust Particles in Air. J. Pfaff 4008
Clouds and Cells. G. T. Walker 4827
See also 959, 2286 *under* 1; 153, 2892, 3991 *under* 2; 533, 965 *under* 3; 1810, 2900, 2901, 3423 *under* 5; 535, 3424, 3425, 3426 *under* 6; 967, 973, 977, 1399, 1813, 1814 *under* 7.

5. Climatology.

World Weather. Part V. G. T. Walker and E. W. Bliss 534
Climatology: Solar Radiation in Greenland. C. Maurain and J. Devaux 969
Micro-Climatology. R. Geiger 1810
Diluvial Ice Age in Equatorial Regions. R. Spitaler 2289
Micro-Climatological Temperature and Humidity Observations with a Thermocouple Psychrometer. V. Rossi 2900
Variations in the Climate of York during the 60 Years 1871–1930 and Comparison with Oxford. E. G. Bilham 2901
Symposium on Climatic Cycles. "Introductory Remarks," by J. C. Merriam; "Evidences of Cycles in Tree Ring Records," by A. E. Douglass; "Periodicity in Solar Variation," by C. G. Abbot and (Mrs.) A. M. Bond; "Nature of the Solar Cycle," by W. S. Adams and S. B. Nicholson; "Correlation of Sedimentary and Climatic Records," by I. Bowman 2902
Influence of Solar Activity on the Earth's Atmosphere. B. Düll 3423
Diurnal Variation of Free Air Temperature and of the Temperature Lapse Rate. J. C. Ballard 4009
Extremes of Cold and Warm Summers and Winters during the Ice Age. R. Spitaler 4010
Mean Temperature of the Two Hemispheres of the Earth. R. Spitaler 4011
11-year Sunspot Period, Secular Periods of Solar Activity, and Synchronous Variations in Terrestrial Phenomena. H. W. Clough 4422
See also 964, 4006, 4007, 4825 *under* 3.

6. Optical Phenomena (Aurora, Night Sky, Corona, Halo, etc.).

Ultra-Violet Transmission Coefficient of the Earth's Atmosphere. R. S. Rockwood and R. A. Sawyer 154
Luminescence of Solid Nitrogen. J. Kaplan 251
Clouded Atmosphere and Abnormal Extinction. F. W. P. Götz 535
Properties of Optically Turbid Medium. Part III. Illumination of Heterogeneous Curved Layers. Theory of the Crimson Light. P. Gruner 536
Visible Part of the Auroral Spectrum. L. Vegard 537, 2903
Air Afterglow and Active Nitrogen. J. K. Robertson 627
Formation of Negative Ions According to Quantum Mechanics. Y. Rocard 628
Investigations of the Auroral Spectrum during 1921–1926. L. Vegard 970
Seat of the Plane of Polarisation in the Celestial Vault. A. Sinjagin 971
Polarisation of Light from the Sky. W. Smosarski 972
Hagen's Obscuring Clouds. K. F. Bottlinger 921
Electronic Bombardment as a Factor in Atmospheric Phenomena. W. M. Cohn 986
Measurement of Visibility at Night. W. E. K. Middleton 1388
Long-Wave Part of the Visible Spectrum of the Night Sky. L. A. Sommer 1392
Auroral Spectrum. J. Kaplan 1393
General Spectrum of the Night Sky as Observed in India. K. R. Ramanathan 1811

Meteorology, *continued.*

Abstract Nos.

Height of the Aurora and Temperature of the Upper Atmosphere. G. Angenheister 1812
Progress in the Photography of the Aurora Borealis. C. Störmer 1826
Rayleigh Scattering in Interstellar Space. O. Struve 2264
Brightness of Twilight at Mallorca with Solar Altitudes between − 9° and − 13°. K. Graff 2290
Most Important Results of Auroral Investigation. C. Störmer 2304
Kinematographic Results of Measurement of Height and Proof of Infra-Red Radiation of the Aurora. W. Bauer 2305
Transmission of Light through Cloud Particles. D. Nukiyama and A. Kobayasi 2345
Infra-Red Content of Daylight. G. B. Harrison 2346
Simple Spectrograph and Infra-Red Absorption Bands of the Solar Spectrum. W. Gorczyński 3424
Atmospheric Transmission in the Water-Vapour Absorption Bands P and Φ. W. Gorczyński and E. Stenz 3425
Water Vapour Absorption in the Infra-Red Region of the Solar Spectrum. E. Stenz 3426
Transparency of the Lower Atmosphere. H. Buisson, C. Jausseran and P. Rouard 3443
Measurement of the Coefficients of Atmospheric Absorption. J. Duclaux 3444
Photometric Observations of Twilight. W. M. Smart 3445
Spectrum of Night Sky. J. Dufay 3446
27-Day Period of Halo Frequency. G. Archenhold 4012
Photoelectric Measurement of Sky Polarisation. Z. Sekera 4013
Transmission of Light through Fog. F. Born, W. Dziobek and M. Wolff 4014
Night Sky Light and the Northern Light. L. A. Sommer 4423
Visibility of Objects in a Searchlight Beam. W. M. Hampton 4545
Visibility of Light Signals by Day. E. Stoecker 4954
Continuous Photoelectric Registration of Polar Auroræ. A. Dauvillier 5231
Auroral Spectrograph and the Upper Atmosphere. L. Vegard 5232
See also 959, 1387, 2286 *under* 1; 4003 *under* 2; 3442 *under* 4; 3423 *under* 5.

7. Meteorological Instruments.

Theory of the Vane Anemometer. B. G. van der H. Zijnen 157
Psychrometer Constant. A Correction. M. Robitzsch 967
Influence of Ventilation on the Readings of a Wet-Bulb Thermometer. H. Bongards 973
Radio-Meteorograph 974
Simple Instrument for Studying Temperature Inversions in the Free Atmosphere. A. K. Das 975
Directional Effect of the Single Hot-Wire Anemometer. M. Ziegler 976
Error in Marking an Aitken Pocket Dust-Counter. V. F. Hess and C. O'Brolchain 977
New Primary Standard Barometer. J. E. Sears, Jr., and J. S. Clark 1394
Aitken Pocket Nuclei-Counter. G. R. Wait 1399
Dependence of the Hair Hygrometer on Temperature. A. Pfeiffer 1813
Theory of Wet and Dry Bulb Hygrometer. F. J. W. Whipple 1814
Calibration of Moving-Vane Anemometers for Low Velocities. R. Loewenstein 1815
Improvements in Psychrometry. D. B. Brooks and H. H. Allen 2291
Apparatus for Determination of Dew Point and Boiling Point of Mixtures of Volatile Liquids. L. Gay and J. Soulié 2480
Registrations with Ångström's Pyranometer. Parts I and II. E. Hasché 3422
Theory of the Psychrometer. Part I. Mechanism of Evaporation. Part II. Effect of Velocity. J. H. Arnold 3679, 4578
Errors in Measurement of Humidity with the Hair Hygrometer. W. Grundmann 4424
Small Wind Meter. E. O. Hulbert 4425
Dew Point Hygrometer. S. R. Williams 4828
Relations between Friction, Heat-Transition and Evaporation. W. Findeisen 4971
Dynamical Pressure Effect on the Friez-Type Aerometeorograph. L. P. Harrison 5233

Meteorology, *continued.*

Abstract Nos.
Hygrometer for Use in Small Spaces. K. Mellanby 5234
See also 1389, 3437 *under* 3; 966, 2899 *under* 4; 2900 *under* 5; 1388 *under* 6.

8. Unclassified.

Point Discharge Method of Measurement of the Radioactivity of the Atmosphere. G. Aliverti 558
Summation Methods in Smoothing Curves. F. Vercelli 890
Geophysical Station at Mogadiscio. M. Bossolasco 978
Meteorological Acoustics. W. S. Tucker 4180

Nebulæ.

1. Galactic.
2. Extra-Galactic.

1. Galactic.

Possible Globular Clusters in Andromeda Nebulæ (M31). J. H. Reynolds 507
Local Star System. F. Becker 517
Radiative Equilibrium of a Planetary Nebula. V. A. Ambarzumian 919
Distribution of Absorbing Galactic Matter. H. Mineur 941
Present Conception of the Structure of the Universe. E. Freundlich 1778
Expansion Hypothesis for Planetary Nebulæ. H. Zanstra 1779
Monochromatic Luminosity of Gaseous Nebulæ. V. Ambarzumian 1780
Proper Motions of Twenty-One Planetary Nebulæ. A. van Maanen 2255
Colours of Diffuse Nebulæ having Continuous Spectra. O. Struve, C. T. Elvey and P. C. Keenan 2847
Problems of Diffuse Matter in the Galaxy. J. S. Plaskett and J. A. Pearce 2860
Star-Counts in the Dark Nebula in Taurus. H. v. Klüber 3403
Physical Analysis of Wolf-Rayet Spectra. Cecilia H. Payne 3411
Intensity of Distribution in Spectrum Lines of Orion Nebula. W. Baade, F. Goos, P. P. Koch and R. Minkowski 3968
Magnitude Frequency Distribution of Wolf-Rayet Stars. D. Hoffleit 3970
Temperatures of the Nuclei of Planetary Nebulæ. R. H. Stoy 4392
Density of Energy in the Universe. S. A. Korff 4406
Classification of Planetary Nebulæ. R. H. Stoy 4796

2. Extra-Galactic.

Red Shift of Light from Spiral Nebulæ. H. E. Buc 105
Physical and Observational Evidence for the Expanding Universe. J. H. Reynolds 106
Expanding Universe. W. de Sitter 107
Expanding Universe. D. D. Kosambi and E. A. Milne 108
Stellar Radial Velocities. R. O. Redman 510
Seventy-Six Thousand Faint Galaxies. H. Shapley 920
Hagen's Obscuring Clouds. K. F. Bottlinger 921
World-Structure and the Expansion of the Universe. E. A. Milne 1347
E. A. Milne's Theory of the Expansion of the Universe. E. Freundlich 1348
Radial Velocity of Some Nebulæ. C. Sola 1367
Spiral Arms as Envelopes. B. M. Peek 1781
Distribution of Remote Galaxies. H. Shapley 1782
Brightness of Extra-Galactic Nebulæ and Galactic Absorption of Light. J. Dufay 1783
Observational Evidence for the Expansion of the Universe. H. Knox-Shaw 1784
Distances and Motions of Extra-Galactic Nebulæ. H. Knox-Shaw 2256
Peculiar Spectra in Magellanic Clouds. Annie G. Cannon 2257
Spherical Condensations in the Expanding Universe. G. Lemaître 2817
Formation of Nebulæ in the Expanding Universe. G. Lemaître 2818
Mass-Particle in an Expanding Universe. G. C. McVittie 2819
Milne's Theory of the Expansion of the Universe. G. C. McVittie 2820
World Structure and the Expansion of the Universe. E. A. Milne 2821
Surface Brightnesses of Elliptical Nebulæ. P. C. Keenan 2848
Distribution of Galaxies. H. Shapley 2849
Spectral Displacement of Extra-Galactic Nebulæ. F. Zwicky 3404
Milne's Theory of World Structure. W. O. Kermack and W. H. McCrea 3947

Nebulæ, *continued.*

Abstract Nos.

Spontaneous Absorption of Radiation and the Red Shift of Lines in the Spectrum of the Nebulæ. E. Sevin 3949
Observation of Bolide of 15th May, 1933. J. C. Sola 3965
See also 507, 1778, 3970 *under* 1.

Oscillations, Electric.

1. Generation.
2. Amplification.
3. Rectification.
4. Measurement of Frequency.
5. Applications.
6. Unclassified.
Cross-References :
Crystal Rectification, *see* Conduction (Electric) in Solids and Liquids, 7.
Cross-References (contd.) *:*
Electric Waves, *see* Radiation, Emission, 4.
Frequency, *see also* Alternating-Current Networks, 1.
Piezoelectric Oscillations, *see* Piezoelectricity, 2.
See also Section B.—Electrical Engineering.

1. Generation.

Spontaneous Generation of Oscillations in Low-Pressure Discharges. S. K. Mitra 399
Rarefied Ionised Gases in H.F. Fields. A. Rostagni 795
Generation of Ultra-Short Electromagnetic Waves by the Barkhausen-Kurz Method. G. Potapenko 1222
3000-kV Impulse Generator. T. E. Allibone, F. S. Edwards and D. B. McKenzie 2076
Propagation of Electric Oscillations along a Tube Containing an Ionised Gas. C. Gutton and (Miss) M. Chenot 2077
Controlled Dark Discharge in Free Air. A. Gemant 3132
Maintained Oscillations. E. Hochard 3247
Barkhausen-Kurz Oscillations. H. Alfvén 3853
Effect of Circuit Parameters on the Constancy of the Frequency of a Pliodynatron. W. C. Sears 3854
Electron Oscillations in High Vacua. J. Müller 3855
Limitation in Currents of Positive Alkali Ions of Homogeneous Velocities. P. Keck and L. B. Loeb 4707
Short-Wave Oscillator for Spectroscopy. H. Pettersson 5346

2. Amplification.

Noises in Amplifiers of Photoelectric Cells. F. v. Orbán 316, 4287
Valve Amplifier for Feeble Pulses. L. F. Curtiss 341
Thermionic Amplifier for the Photometry of Stars. A. E. Whitford 506
New Selenium Light Relay. L. Bergmann 803
D.C. Amplifier with Good Operating Characteristics. A. H. Taylor and G. P. Kerr 1596
Amplifier for Photoelectric Cells. G. A. Goutry 1663
D.C. Amplifier. P. A. Macdonald and Jean T. Macpherson 2094
Use of Valve Electrometer with Extremely High Input Resistance. R. E. Burroughs and J. A. Ferguson 4217
Voltmeter Amplifier. J. Roulleau 4218
High Voltage-Sensitivity D.C. Amplifier. P. A. Macdonald and E. M. Campbell 4219
Evacuated Amplifying Device for the Measurement of Photoelectric Currents. J. F. H. Custers 4220
Resistance-Coupled Amplifier for Measuring Ionisation Currents. L. F. Curtiss 4221
Amplification of D.C. with a Tetrode. P. Donzelot and J. Divoux 4222
Improved Balanced Circuit for Use with Electrometer Tubes. L. A. Turner and C. O. Siegelin 4223
Improved D.C. Amplifying Circuit. L. A. DuBridge and H. Brown 5019

3. Rectification.

New Detector. J. Cayrel 3758

Oscillations, Electric, *continued*.

4. Measurement of Frequency.

Abstract Nos.
Quartz Clock for Time and Frequency Measurement of Very High Accuracy. A. Scheibe and U. Adelsberger 500
Wide Range Interference Wavemeter for Laboratory Use. L. Rohde and H. Schwarz 793
Method of Measuring Harmonics in H.F. Circuits. M. Osnos 794
Improved Vibrograph and Applications. T. Tirunarayanachar 873
Quartz Clocks as Timekeepers. A. Scheibe 3957
Resonance Frequency of Two Coupled Oscillating Circuits. W. Fehr and K. Kreielsheimer 4697
Frequency and Behaviour of the Quartz Clock of the Physikalisch-Technischen Reichsanstalt. A. Scheibe and U. Adelsberger 4793

5. Applications.

Rapid Brightness Fluctuations in Lamp Filament. G. Wataghin 1223
Rapid Brightness Fluctuations in Lamp Filament. R. Deaglio 1224
Light from a Filament Heated by Electronic Bombardment. G. Wataghin 1225
See also 500, 794, 3957, 4793 *under* 4.

6. Unclassified.

Absorption of the Debye-Falkenhagen Relaxation Force in a Neutral, Partially Ionised Gas. K. F. Niessen 400
Magnetostriction Oscillator Producing Intense Audible Sound and Some Effects Obtained. N. Gaines 678
Damping of Oscillations of Very High Frequency. A. Witt 796
Circuits with a Capacity in Parallel with a Saturated Diode. C. Dei 1243
H.F. Voltage Diagrams. U. Bab 1654
Analogy between Electrical and Mechanical Oscillations. C. Ramsauer 3856
Current Measurement by Means of the Kathode-Ray Oscillograph. A. Matthias, B. v. Borries and E. Ruska 5012

Photochemistry (including Photography).

1. General.
2. Photography :
  (*a*) Theory.
  (*b*) Contrast, Gradation and Density.
  (*c*) Development, Fixation, Reduction, Intensification, Toning, Washing, Drying.
  (*d*) Sensitivity, Sensitisation, Desensitisation, Sensitive Material, Sensitometry.
  (*e*) Emulsions and Emulsion Processes.
  (*f*) Latent Image, Print-Out Effect, Herschel and Villard Effects.
  (*g*) Kinematography and Colour Photography.
2. Photography (*contd.*) :
  (*h*) Applications. Industrial Reproduction.
  (*i*) Apparatus, Instruments and Photographic Light Sources.
  (*j*) Unclassified.
Cross-References :
Becquerel Effect, *see* Photoelectricity, 5.
Fluorescence Spectra, *see* Spectroscopy, 5.
Photographic Photometry, *see* Photometry, 3.
Photovoltaic Cells, *see* Photoelectricity, 5.
Stellar Photography, *see* Stars, 9.
X-Ray Photography, *see* X-Rays, 4.

1. General.

Five-Electron Problem in Quantum Mechanics and Its Application to the Hydrogen-Chlorine Reaction. G. E. Kimball and H. Eyring 94
Photochemical Decomposition of Nitrous Oxide Sensitised by Mercury Vapour. W. M. Manning and W. A. Noyes, Jr. 186
Decomposition of Hydrogen Molecules by Impact with Excited Xenon Atoms. H. R. Calvert 187
Oxidation of Solutions of Iodoform. René Dubrisay and G. Emschwiller 188
Photo-Bromination of Benzene. E. Rabinowitsch 189
Absorption Spectrum of Nitrous Oxide and Heat of Dissociation of Nitrogen. A. K. Dutta 301
Intensity of Incident Light and Velocity of a Photochemical Reaction. W. V. Bhagwat 571
Photochemistry of Phosphine. H. W. Melville 572, 2362
Absorption Spectrum and Dissociation Constants of Arsenic Acid. P. Goldfinger and H. D. G. v. Schweinitz 617

Photochemistry (including Photography), *continued.*

Abstract Nos.

Inhibition of Photochemical Decomposition of Ammonia by Atomic Hydrogen. H. W. Melville 1002
Photochemical Decomposition of Phosgene Vapour. F. Almasy and T. Wagner-Jauregg 1003
Photodissociation of Hydrogen Peroxide. G. v. Elbe 1442
Photo-Oxidation of Gaseous Hydrogen Iodide. J. R. Bates and G. I. Lavin . . 1443
Temperature Coefficient of the Photosensitised Hydrogen-Oxygen Reaction. H. S. Taylor and D. J. Salley 1444
Reaction of Hydrogen Atoms with Oxygen and the Hydrogen-Chlorine Reaction. J. R. Bates 1445
Combination of Hydrogen and Oxygen Photosensitised by Nitrogen Peroxide. R. G. W. Norrish and J. G. A. Griffiths 1446
Photochemical Kinetics of the Iodine-Oxalate Reaction. Part I. E. Abel, H. Schmid and K. Retter 1447
Photochemical Oxidation of Phosgene. G. K. Rollefson and C. W. Montgomery 1448
Photochemistry of Mixtures of Chlorine, Oxygen and Carbon Monoxide. G. K. Rollefson 1449
Anomalous Decomposition of Ozone in the Presence of Chlorine. L. J. Heidt, G. B. Kistiakowsky and G. S. Forbes 1450
Photochemical Reactions of Oxalates with Bromine and with Iodine. Parts I and II. R. O. Griffith, A. McKeown and A. G. Winn 1853
Primary Photochemical Processes. Part II. Absorption Spectrum and Photochemical Decomposition of Diazomethane. W. Kirkbride and R. G. W. Norrish 1854
Photochemical Action of Complex Radiations. C. Winther 1855
Photochemical Change of N-Chloroacetenilide in Various Solvents. F. W. Hodges 2363
Photochemistry of Hydrogen Sulphide. N. O. Stein 2364
Photochemical Decomposition of Chlorine Monoxide between 2350 and 2750 Å and the Significance of the Absorption Spectrum in this Region. H. J. Schumacher and R. V. Townend 2365
Photochemical Reactions of Monoalkyl Malonic Acids. D. Coster and A. van der Ziel 2366
Photochemical Kinetics of Reactions between Chlorine, Hydrogen and Oxygen. M. Bodenstein and P. W. Schenk 2367
Action of Ultra-Violet Radiation on Aqueous Solutions of Gelatin. P. Ponthus 2687
Elementary Processes of Photochemical Dissociation. L. Goldstein 2959
Photosynthesis in Tropical Sunlight. N. R. Dhar and A. Ram 2960
Photosynthesis of Hydrogen Chloride. M. Ritchie and R. G. W. Norrish 2961, 3500
Photochemical Separation of Isotopes. W. Kuhn and H. Martin 2962
Photostationary States of Geometrically Isomeric Acids. A. R. Olson and F. L. Hudson 2963
Photolysis of Solutions of Alkali Metals in Liquid Ammonia. R. A. Ogg, Jr., P. A. Leighton and F. W. Bergstrom 2964
Continuous Absorption Spectrum of Polyatomic Molecules. Y. Hukumoto . . 3035
Sensation of Light as a Photochemical Process. D. Roaf 3614
Decomposition of Sodium Azide by Controlled Electron Bombardment and by Ultra-Violet Light. R. H. Müller and G. C. Brous 3745
Behaviour of Dry Mixtures of Hydrogen and Chlorine in the Light. F. Bernreuther and M. Bodenstein 4468
Photochemical Union of Chlorine and Hydrogen in the Presence of Oxygen. D. L. Chapman and J. S. Watkins 4469
Quantitative Optical Determination of Photochemical Reaction Products. E. Miescher 4881
Effect of Light on Rubidium Iodide Vapour. M. S. Desai 4882
Intensity Filter for Hg Line 253·7 $m\mu$. H. W. Melville and H. J. Walls 5263
Photochemistry of the AgCl-Crystal. F. Löhle 5281
Quantum Yields of the Photochemical Reactions of Phosgene. C. W. Montgomery and G. K. Rollefson 5282
See also 2374 *under* 2 (*d*).

2. Photography.

(*a*) *Theory.*

Application of Blair-Leighton Equation to X-Rays. J. A. Lester and J. M. Blair 1451

Photochemistry (including Photography), *continued.*

Abstract Nos.

Germ and Pro-Germ Formation in Relation to the Development Centres of the Exposed Homogeneous Silver Bromide Grain. L. Hamburger **2368**
Intermittency Effect and the Reciprocity Law Failure in Photographic Exposure. J. H. Webb **2965**
Photographic Reciprocity Law Failure for Radiations of Different Wave-Length. J. H. Webb **4470**
See also **1859, 4057** *under* **2** (*d*) ; **193, 1861** *under* **2** (*f*).

(*b*) *Contrast, Gradation and Density.*

Reflection Densitometer for Photographic Papers. C. W. Kendall......... **574**
Accurate Measurement of Photographic Density. P. Fleury and G. A. Boutry **2971**
Precision Densitometer. G. A. Boutry **2972**
Dependence of Reflection Density of Photographic Paper on Orientation with Respect to Incident Light. R. E. Owen and T. D. Sanders........ **4472**
Influence of Opening of Pencils Used in Determining Photographic Density. G. A. Boutry **4887**
See also **4885** *under* **2** (*f*) ; **4061** *under* **2** (*g*) ; **1459, 1865, 4063** *under* **2** (*i*).

(*c*) *Development, Fixation, Reduction, Intensification, Toning, Washing, Drying.*

Sensitisation by Auxiliary Exposure. W. Hartree and A. V. Hill........... **190**
Yellowness in Sepia Toning. E. E. Jelley.. **1004**
Action of Developer on Latent Images of Different Ages. C. Jausseran **1452**
Silver Filter for Ultra-Violet Light. G. C. Brock................................ **3479**
Fine Grain Development. H. Funk.. **3501**
Improved Process for Physical Development of Plates, Films and Lantern Slides. A. F. Odell **4471**
See also **2368** *under* **2** (*a*) ; **2369, 2374, 3502, 4884** *under* **2** (*d*) ; **2370** *under* **2** (*e*) ; **1857, 4056** *under* **2** (*f*).

(*d*) *Sensitivity, Sensitisation, Desensitisation, Sensitive Material, Sensitometry.*

Thallium in Silver Bromide. Lüppo-Cramer **191**
Unexplained Fog Formation. Lüppo-Cramer **192**
Actinic Measurement by Sensitometric Methods. O. Reeb **573**
Nuclear Activation. Lüppo-Cramer **1005**
Desensitising Sensitisors. Lüppo-Cramer **1006**
Lattice Disturbance. Lüppo-Cramer **1007**
Hypersensitisation : Part III. Influence of Silver Ions on the Spectral Sensitivity of Silver Bromide Plates containing Dyestuffs. J. I. Bokinik and Z. A. Iljina **1008**
Influence of Alkali Iodides on the Solarisation of Photographic Emulsions. A. Charriou **1453**
Uses of Dyes in Photography. O. Bloch **1454**
Comparison of the Photographic Elementary Processes in Alkali and Silver Salts. R. Hilsch and R. W. Pohl **1856**
Influence of Grain Condition on the Blackening Sensitivity by Exposure to α-Particles. Marietta Blau and Hertha Wambacher.......................... **1859**
Recent Development in Infra-Red Photography. O. F. Bloch.................. **1860**
Photographic Detection of Protons Liberated by Neutrons. Part II. Marietta Blau and Hertha Wambacher **2333**
Present Position of the Sensitometric Systems. M. Lebelle **2369**
Absolute Sensitivity of Photographic Layers to Blue and Green Light. M. Biltz **2371**
Light-Sensitive Surface Films. Part III. F. Weigert and E. Eberius **2374**
Testing a Tube Sensitometer. W. S. Armstrong **2375**
Action of Ultrasonic Waves on Photographic Plates. N. Marinesco and J. J. Trillat **2510**
Photographic Reversal by Desensitising Dyes. B. H. Carroll and C. M. Kretchman **2966**
Solarisation. Part VI. Solarisation with Physical Development. H. Arens **2968**
Optical Properties of Photographic Films. E. Lau and J. Johannesson **2969**
Photochemical Behaviour of Halogen Silver Emulsions to New Desensitisers and Developers. G. Kraft **3502**
Performance of Photographic Layers in the Spectrography of all Wave-Lengths. J. Eggert **3503**
Recent Advances in Sensitisers for Infra-Red Photography. L. G. S. Brooker, F. M. Hamer and C. E. K. Mees.. **3504**

Photochemistry (including Photography), ***continued.***

Abstract Nos.

Increase in Sensitivity of Photographic Emulsions by Electrophoresis. A. Charriou 3505
Mechanism of Hypersensitisation. J. I. Bokinik and Z. A. Iljina 3506
Long-Wave Arc Spectra of Alkalies and Alkaline Earths. W. F. Meggers 3566
Theory of the Ideal Colour Sensitivity of Photographic Materials. J. E. de Langhe 4057
Influence of Temperature on the Chromatic Sensitivity of Photographic Plates. (Miss) J. Clavier 4058
Influence of the Hydrogen-Ion Concentration on the Light Sensitivity of Gelatin-Free Silver Bromide. A. J. Rabinowitsch and C. S. Bagdassarjan 4059
Schwarzschild Effect on Gelatin-Free Silver Bromide. A. J. Rabinowitsch and C. S. Bagdassarjan 4060
Apparatus for the Determination of the Colour Sensitivity of Photographic Layers. J. O. Brand 4883
Developers and Sensitivity. R. Davis and G. K. Neeland 4884
Electrostatic Properties of Photographic Films. D. C. Rose 4888
D.I.N. System of Grading Photographic Plates. M. Biltz 5283
Characteristic Curves of Photographic Plates in the Ultra-Violet. B. K. Johnson and M. Hancock 5284
Sensitisers for Red and Infra-Red Regions. W. Dieterle, H. Dürr, and W. Zeh 5285
See also **2368** *under* **2** (*a*); **190** *under* **2** (*c*); **196, 1457, 1863, 2370, 2373, 3004, 4473** *under* **2** (*e*); **1010, 4063** *under* **2** (*i*).

(*e*) ***Emulsions and Emulsion Processes.***

Effect of Variables in Sensitisation of Photographic Emulsions by Dyes. B. H. Carroll and D. Hubbard 196
Influence of Pressure on the Photographic Sensitivity at Different Monochromatic Radiations. N. Tsize and C. Ling-Chao 1457
Photographic Emulsion: Mechanism of Hypersensitisation. B. H. Carroll and D. Hubbard 1863
Criterion of the Speed of Emulsions for Negatives for the Requirements of Modern Practice. F. Lapeyre 2370
Diazo-Compounds in Photography. H. D. Murray 2373
Present Position of Fine Grain Emulsions. K. Fischer 2970
Infra-Red Spectra of Neon, Argon and Krypton. W. F. Meggers and C. J. Humphreys 3004
Response of a Photographic Emulsion to α-Rays. T. R. Wilkins and R. N. Wolfe 4473
Highly-Dispersed Emulsions. Part II. Lüppo-Cramer 5286
Action of Silver Iodide on Silver Bromide. Lüppo-Cramer 5287
See also **4471** *under* **2** (*c*); **1006, 1007, 1008, 1453, 1454, 2369, 3502, 3505, 4884** *under* **2** (*d*); **4064** *under* **2** (*i*).

(*f*) ***Latent Image, Print-out Effect, Herschel and Villard Effects.***

Effect of Intensity and Underlying Fogs on the Latent Image. F. E. Poindexter and L. E. James 193
Latent Image and Physical Development. H. Arens 1857, 4056
Development of the Latent Image. C. Jausseran 1858
Herschel Effect as a Result of Simultaneous Forward and Reverse Reactions. K. M. Joehnck and J. M. Blair 1861
Silver Nucleus Theory of the Latent Image. Part II. Size and Nature of the Nuclei and Pro-Nuclei in Silver Bromide Emulsions. W. Reinders and L. Hamburger 2372
Photographic Method of Measuring the Relative Intensities of Spectral Lines. K. B. Thomson and O. S. Duffendack 2451
Latent Photographic Image. R. W. Pohl 2967
Intermittency Effect in Photographic Exposure. J. M. Blair and M. C. Hylan 4885
Time Lag in the Formation of the Latent (Photographic) Image. L. I. Zimmerman 4886
Latent Image. C. Winther 5288
See also **1451** *under* **2** (*a*); **1452** *under* **2** (*c*).

(*g*) ***Kinematography and Colour Photography.***

Slow-Motion Photography in the Service of Technical Physics. W. v. Ohnesorge 194
Kinematography with High Picture Frequency. W. Ende 195

Photochemistry (including Photography), *continued.*

Abstract Nos.

Kinematography of Oxide Kathodes Using the Electron Microscope. E. Brüche and H. Johannson 806
New Investigations of Kathodes with the Electron Microscope. E. Brüche and H. Johannson 807
Time of Exposure for Autochromatic Photography. F. Lapeyre 1455
Photometric Determination of Camera Exposures for Motion Picture Work. M. Gundelfinger and W. Stafford 1456
Progress in the Photography of the Aurora Borealis. C. Störmer 1826
Modification of the Chronophotographic Method and Applications. E. Crausse and J. Baubiac 1862
Eclipse Kinematography. S. A. Korff 2277
Conditions for Kinematograph Projection. J. Marette 4061
Simple Micro-Kinematograph. R. W. G. Wyckoff and J. B. Lagsdin 4062
See also 1008, 1454 *under* 2 (*d*) ; 2373, 5286 *under* 2 (*e*).

(*h*) *Applications. Industrial Reproduction.*

Investigation of the Cooling of Glowing Silit Rods by Photographic Pyrometry. R. Hase 287
Propagation Tests and Photography of the Disturbance Emitted by the Explosion of Commercial Electric Detonators. D. B. Gawthrop 1129
Photographic Method of Deriving Optical Constants of Metals. S. E. Williams 1438
Photographic Process for Preparing Topographical Maps. R. Ferber 1802
Improvements in Microphotography with Ultra-Violet Light. A. Köhler 1864
See also 4471 *under* 2 (*c*) ; 1860 *under* 2 (*d*) ; 194, 1862 *under* 2 (*g*).

(*i*) *Apparatus, Instruments and Photographic Light Sources.*

Spectrophotography of "Flash" Sources or of Sources of Low Intensity. W. Kraemer 260
Kathode-Ray Oscillograph: Direct Records on Photographic Paper. W. Förster 338
Standards of Light for Photographic Sensitometry. (Miss) P. Lévy 1009
New Sensitometer for Sensitivity Measurements. H. Göthel and W. Seifert 1010
Dimensions of the 16-mm. Sound Film. R. P. May 1458
Recording Microphotometer. B. Lange 1459
Preparation of Circular Neutral Absorption Wedges. G. Haase 1461
Defects of Large Aperture Objectives. G. Bonnerot 1478
Comparator for Screen and Tone Negatives. H. M. Cartwright 1865
Progressive Lightning ; New Stereoscope. C. V. Boys 2299
Textile Mutochrome. C. F. Smith 2973
Photographic Analysis of Explosion Flames. W. A. Bone 3098
Photographic Recording of Oscillatory Motion. E. Raetsch 3355
Phototechnical Properties of 32 Commercial Photographic Films. U. Schmieschek 4063
Photographic Plates for Use in Spectroscopy and Astronomy. C. E. K. Mees 4064
Optical Determination of the Diffusion Constant of Sodium. L. A. Ginsel and L. S. Ornstein 4342
Deviations of an Inclined Beam of Finite Aperture in the Meridian Section of a Centred Lens System. A. W. Tronnier 5302
See also 574, 4887 *under* 2 (*b*) ; 573, 2969, 4883 *under* 2 (*d*) ; 195 *under* 2 (*g*) ; 1864 *under* 2 (*h*).

(*j*) *Unclassified.*

Photoanisotropic Effect in Dyes. T. Kondo 180, 994

Photoelectricity.

1. Photoelectric Emission (General Theory).
2. Photoelectric Emission (Special Substances).
3. Photoelectric Cells (Emission).
4. Photoconductive Cells. Photoconductivity.
5. Photovoltaic Cells. Becquerel Effect.
6. Applications.
7. Unclassified.

Cross-References :
Photoelectric Photometry, *see* Photometry, 3.
Theory of Conduction in Metals, *see* Conduction (Electric) in Solids and Liquids, 1.

1. Photoelectric Emission (General Theory).

Atoms of Action, Electricity and Light. A. Fleming 216
Electron Theory of Metals. R. Peierls 717
Calculation of the Long-Wave Limit of the Photoelectric Effect from the Atomic Volume of the Element. G. Schweikert 797

Photoelectricity, *continued*.

Abstract Nos.

Internal Conversion Coefficient for Radium. C. H. R. Hulme 990
Theory of Internal Conversion of γ-Rays. H. M. Taylor and N. F. Mott 991, 4846
Photoelectric Effect of Electric Spark Radiation. J. Meiklejohn............ 1655
Photoelectric Currents in Gases between Parallel Plate Electrodes. L. A. Young and N. E. Bradbury 1656
Recent Developments in the Study of the External Photoelectric Effect. L. B. Linford 2653
Conservation of Energy and Momentum in the Photoelectric Effect. J. Kunz 2654
Classical Distribution of Electrons Due to Photoelectric Absorption of X-Rays. J. Kunz 2655
Distribution of Photoelectrons in the M-Layer of Atoms Resembling Hydrogen. J. Kreisler 3248
Theory of the Energy Distribution of Photoelectrons. L. A. DuBridge 3249
Theory of Complex Photoelectric Effects. L. Goldstein.................... 4279
Internal Conversion. J. Solomon 4444, 4847
Test of the Classical "Momentum Transfer" Theory of Accommodation Coefficients of Ions at Kathodes. K. T. Compton and E. S. Lamar...... 4703
See also 2078, 5489 *under* 2.

2. Photoelectric Emission (Special Substances).

Photoelectric Properties of Alkali Metal Films. J. J. Brady................ 401
Electronic Emission of Metals under X-Rays. H. Küstner.................. 402
Thermionic and Photoelectric Work Functions of Molybdenum. L. A. Du Bridge and W. W. Roehr 412
Crystal Structure of Electrodeposits from Copper Acetate Solutions. S. J. M. Allen, H. Kerst n and J. Maas 428
New Photoelectric Effect. Q. Majorana...................... 798, 1236, 2088
Selective Photoelectric Effect at Thin Films of Alkali Metals. R. Suhrmann and A. Schallamach 799
Metallic Films and Surfaces. K. Richter 843
Method of Measuring Photoelectric Currents in Semi-Conductors. B. Schönwald 1228
Photoelectric Emission from Different Metals. H. C. Rentschler, D. E. Henry and K. O. Smith 1229
Emission of Grids in Triodes. M. Pinna 1241
Optical and Photoelectric Investigations of Thin Metallic Films. R. Schulze 1657
Photoelectric Emission from Metastable Atoms. C. Kenty 2078
Selective Photoelectric Emission from Compound Alkali Kathodes. W. Kluge 2079
Sensitiveness of Cæsium Oxide Kathodes. G. Déjardin and R. Latarjet 2080
Electrical Phenomena in Lead Glance Crystals Caused by Light, Heat and Kathode Rays. E. Rupp 2081
Electron Emission of Metals under the Influence of Monochromatic X-Rays. H. Hase 2082
Action of a Periodically Variable Beam of Light on Metallic Films. Q. Majorana 2656
Conditions of the Photoelectric Effectiveness of Hydrogen on Platinum. G. Bethe 2657
Connection between Characteristic Vibration and Selective External Photoelectric Effect. Parts I and II. F. Hlučka.................................. 2658
Connection between Characteristic Vibration and Selective External Photoelectric Effect. Part III. Behaviour of Coal Tar Substances in the Ultra-Violet. F. Hlučka 2659
Periodic Photoelectric Effect of Thin Layers with Monochromatic Illumination. F. Hlučka 2660
Emission of Electrons from Metallic Films in X-Rays. J. Klein 2661
Photoelectric Emission in a Magnetic Field. R. Schmid.................. 2662
Action of Periodically-Varying Light on a Metallic Plate. Q. Majorana 3250
New Photoelectric Effect. A. Etzrodt 3251
Photoelectric Investigations of the Influence of Matter upon Very Slow Electrons. G. Lang 3252
Photoelectric Effect in Insulators with Plane Polarised Light and its Dependence upon Angle of Incidence. Susanne M. Spies 3253
Influence of Oxygen and Sulphur on the Photoelectric Effect of the Alkalies (K and Na). P. W. Timofeew and W. W. Nalimow 3254
Photoelectric Sensitivity of Magnesium. R. J. Cashman and W. S. Huxford .. 3256

Photoelectricity, *continued.*

Abstract Nos.
Photoelectric Threshold of Rhenium. A. Engelmann 3857
Photoelectric Effect of Cuprite Crystals. Anna and A. Joffé 3858
Evacuated Amplifying Device for the Measurement of Photoelectric Currents. J. F. H. Custers 4220
Electron Diffraction and Photoelectric Action of Alkali Metal Surfaces. W. Kluge and E. Rupp 4257
Inner Photoelectric Effect in Metals. R. Schulze 4280
Interior Photoelectric Effect in Cuprous Oxide. D. Nasledow and L. Nemenow 4281
Non-Additive Effect of Different Radiations on Copper Oxide Photoelectric Elements. C. Lapicque 4282
Photoelectric Effect for Single Crystals of Cuprite. R. Deaglio 4283
Internal Photoelectric Absorption in Halide Crystals. R. W. Gurney 4284
Photoelectric Effect of Crystals of Argentite, Proustite and Pyrargyrite. G. Athanasiu 4285
Thermionic and Photoelectric Emission of Caesium-Caesium Oxide Kathodes as Influenced by Incorporation of Caesium Atoms in the Dielectric. J. H. de Boer and M. C. Teves 4295
Influence of the Metal Surface on the Position of the Selectivity in the External Photoelectric Effect. F. Hlučka 4699
Selective Behaviour of Alloys with the External Photoelectric Effect. F. Hlučka 4700
External Photoelectric Effect in Alkali Halides. R. Fleischmann 4701
Emission of Electrons from Tungsten and Molybdenum under the Action of Soft X-Rays from Copper. J. Bell 4702
Photoelectric Effect in Monocrystals of Cu$_2$O. R. Deaglio 5090
Photoelectric Effect for Single Crystals of Cuprite. G. Mönch and R. Stühler 5091
Hall Effect and Internal Photoelectric Effect in Cuprous Oxide. I. Kikoin and M. Noskov 5450
Analysis of the Secondary Radiation from Aluminium, Nickel, Silver and Gold at the Surfaces of Incidence and of Exit of X-Rays. H. Schenck 5483
Influence of the Absorbed Gas Layer on Photoelectric Sensitivity. B. Abendroth 5484
Work Function and Photoelectric Properties of Metals. P. I. Lukirsky 5489
Thermionic and Photoelectric Emission of Caesium-Caesium Oxide Kathodes as Influenced by Incorporation of Caesium Atoms in the Dielectric. P. Görlich 5490
See also 2653 *under* 1; 3263, 3264 *under* 4; 3260 *under* 5.

3. Photoelectric Cells (Emission).

Noises in Amplifiers of Photoelectric Cells. F. v. Orbán 316, 4287
Caesium Oxide Photoelectric Cells. J. C. Peters, Jr. and E. B. Woodford 403
Limiting Magnitude Observable with a Photoelectric Stellar Photometer. S. Smith 926
Spectral Transmission of Filters for Actinometers, Photoelectric Cells and Photometers. K. Büttner and E. Sutter 997
Gasfilled Photoelectric Cells. G. A. Boutry 1230
Inertia in Gasfilled Photoelectric Cells. F. Ollendorff 1231
Action of a Magnetic Field on a Gasfilled Photoelectric Cell. P. Fourmarier 1232
Rating of Photoelectric Tubes. L. R. Koller 1233
Photoelectric Cells. N. R. Campbell 1234
Erythemal Measurement of Ultra-Violet Radiation. A. H. Taylor 2072
Functional Régime of Gasfilled Photoelectric Cells. L. Dunoyer and P. Paounoff 3261
Use of Photoelectric Cells Coated with Fluorescent Substances, as Measuring Instruments in the Ultra-Violet. Study of the Sensitivity Curve. P. Dubouloz 3859
Photoelectric Properties of Magnesium. G. Déjardin and (Miss) R. Schwégler 3860
Optical Absorption at Surface Layers with Double Photoelectric Spectral Selectivity. W. Kluge 3861
Photoelectric Valve. J. Kunz and J. T. Tykociner 3862
Photoelectric Measurement of Sky Polarisation. Z. Sekera 4013
Conduction of the Second Type in a Gasfilled Photoelectric Cell. L. Dunoyer and P. Paounoff 5092
See also 2081, 3254, 3256 *under* 2; 2952 *under* 6.

Photoelectricity, ***continued.***

4. Photoconductive Cells. Photoconductivity.

Abstract Nos.

Photoconductivity. F. C. Nix 407
Photoelectric Conductivity of Semi-Conductors. W. Leo 801
Infra-Red OH band of Phenol. M. Naherniac 1053
Internal Photoelectric Effect in Crystals. A. H. Wilson 1235
Theory of the Crystal-Photoelectric Effect. H. Teichmann 1662
Saturation Current in Photoelectric Conduction of Röntgenised Rock-Salt. N. Kalabuchow 2086
Photoelectric Cells for Daylight Measurement. H. H. Poole and W. R. G. Atkins 2975
Photoelectric Effect in the "Active Layer" of Carborundum Crystals. O. W. Lossew 3255
Selenium Rectified Photoelectric Cells. L. Bergmann 3262
Photoelectric Conductivity and Absorption of Lenard Phosphors. L. Weber 3263
Internal Photoelectric Effect in Liquid Dielectrics. G. Liandrat 3264
Electronic Properties of Conductors and Insulators. R. H. Fowler.... 4210
Photoelectric Secondary Current. W. Lehfeldt 5486
See also 1228 *under* 2; 1234, 3860 *under* 3.

5. Photovoltaic Cells. Becquerel Effect.

Copper-Oxide and Photronic Cells. V. H. Bartlett 404
Application of Photronic Cells. G. A. Shook and Barbara J. Scrivener.... 405
Blocking-Layer Photoelectric Effects. F. Waibel and E. Rupp.... 406
Spectral Sensitivity of Photovoltaic Piles of Copper Electrodes Coated with Cuprous Oxide. G. Athanasiu 800
Becquerel Effect at Selenium Electrodes. M. Volmer and W. Moll 802
Existence of a Blocking-Layer Photoelectric Effect in Galena. E. Tiede and G. Brückmann 1658
Measurements of Blocking-Layer Rectifier Photoelectric Cells. W. Meyer and A. Schmidt 1659
Dependence of Rectifier Photoelectric Cells upon Luminosity and Wave-Length. A. Goldmann and M. Lukasiewitsch.... 1660
Dependence of Rectifier Photoelectric Cells upon Luminosity and Wave-Length. A. Goldmann 1661
Current Reversal from a Cuprous Oxide Photoelectric Cell in Red Light. H. H. Poole and W. R. G. Atkins 2083
Effect of X-Rays on Rectifier Photoelectric Cells. K. Scharf and O. Weinbaum 2084
Photronic Photoelectric Cells. B. P. Romain 2085
Electronic and Chemical Effects in Photovoltaic Cells. R. Audubert 2087
Photoelectric Instrument for Comparing the Strengths of Coloured Solutions. E. W. H. Selwyn 2938
Copper-Cuprous-Oxide Rectifier and Photoelectric Cell. L. O. Grondahl 3162
Electrochemical Properties of Photosensitive Electrodes in Copper Salts. R. Audubert 3196
Photoelectric Effect in the Blacking-Layer in Ultra-Violet Light. D. N. Nasledow and L. M. Nemenow.... 3257
Evidence for Boundary Layer in Cuprous Oxide Rectifier (Blocking-Layer) Photoelectric Cells. F. Rother and H. Bomke.... 3258
Blocking-Layer Photoelectric Cells. M. Borissow, C. Sinelnikow and A. Walther 3259
Effect of Frequency on the Blocking-Layer Photoelectric Cell. P. Görlich.... 3260
Semi-Conductors: Dark Conduction and Photoelectric Conduction in Cuprous Oxide. E. Engelhard 4225
Mechanism of Action of Light on Electrodes Photosensitised by Copper Salts. R. Audubert 4247
Equivalent Circuit of a Blocking-Layer Photo-Cell. L. A. Wood.... 4286
Blocking-Layer Photoelectric Effect and the Einstein Relationship. F. v. Kőrösy and P. Selényi 5089
Cuprous Oxide Photoelectric Cells. W. Bulian.... 5485
See also 803 *under* 6.

6. Applications.

Automatic Time-Recorder. L. A. Richards and L. A. Wood.... 115
Photoelectric Method of Measuring the Rotatory Dispersion of Certain Sugars in the Near Ultra-Violet. G. Bruhat and P. Chatelain.... 204

Photoelectricity, *continued*.

Abstract Nos.

New Selenium Light Relay. L. Bergmann 803
Photoelectric Measurement of Faint Light. G. L. Locher 1011
Photoelectric Visibility Measurements. Part II. L. W. Pollak and W. Gerlich 1090
Smoke-Density Meter. R. D. Bean 1237
Energy Distribution in Grating Spectra. U. Schmieschek and E. Spiller 1521
Investigation of the Glow of Phosphorus with the Aid of a Photoelectric Counter. C. Ouellet 2357
Registering Photoelectric Cell Pyrometer. G. Müller and H. J. Zetzmann 2487
Determination of *e*/*m* by Means of Photoelectrons Excited by X-Rays. G. C. Kretschmar 2601
Decreasing the Time of Gravity Torsion Balance. J. W. Joyce 2745
Standing Light Waves. Repetition of an Experiment by Wiener, Using a Photoelectric Probe Surface. H. E. Ives and T. C. Fry 2952
Photoelectric Polarimetry. G. Bruhat and P. Chatelain 2980
Photoelectric Polarimeter. G. Bruhat and A. Guinier 2981
Kinetics of the Carbon Dioxide-Carbonic Acid Reaction. R. Brinkman, R. Margaria and F. J. W. Roughton 3685
Photoelectric Reading Machines. G. Schutkowski 4288
Applications of Rectifier Photoelectric Cells in Photometry. B. Lange 4892
Photometric Measurements Using Gas-Filled Photoelectric Cells. T. D. Gheorghiu 4893
Continuous Photoelectric Registration of Polar Auroræ. A. Dauvillier 5231

7. Unclassified.

D.C. Amplifier with Good Operating Characteristics. A. H. Taylor and G. P. Kerr 1596
Amplifier for Photoelectric Cells. G. A. Boutry 1663
Contact Potential Differences between Different Faces of Copper Single Crystals. H. E. Farnsworth and B. A. Rose 4665

Photometry.

1. Theory.
2. Visual Methods.
3. Physical Methods.
4. Spectrophotometry.
5. Standards, Units.
6. Unclassified.

Cross-References:
Colour Measurement, *see* Colorimetry.
Reflecting Power, *see* Reflection, Refraction and Dispersion, 1.
Stellar Photometry, *see* Stars, 1, 3, 4.
X-Ray Photometry, *see* X-Rays, 10.

1. Theory.

2. Visual Methods.

Heterochromatic Measurements with the Pulfrich Photometer. E. Mayer 197
Slide Rule for Use with a Polarisation Photometer. M. Richter 198
Spectral Transmission of Filters for Actinometers, Photoelectric Cells and Photometers. K. Büttner and E. Sutter 997
Proposed Scale for Specifying the Chromaticity of Incandescent Illuminants and Various Phases of Daylight. I. G. Priest 1866
Colour Filters for Altering Colour Temperature. Pyrometer Absorption and "Daylite" Glasses. H. P. Gage 1867
Photometry and Acuteness of Vision. G. Holst 2376
Measurement of the Transmission Factors of Coloured Filters Used in Heterochromatic Photometry. G. Ribaud 2377
Heterochromatic Photometry with Tungsten-Filament Lamps. G. Ribaud 2378
Surface Brightness of Light Beacon Projectors. A. Blondel 3507
Precision of Visual Photometry. Y. le Grand 4065
Heterochromatic Photometry with Tungsten-Filament Lamps. G. Ribaud 4889
Photometry of Gaseous Discharge Tubes. W. Dziobek and O. Reeb 4890
Neutral Value Scales. Part I. Munsell Neutral Value Scale. A. E. O. Munsell, L. L. Sloan and I. H. Godlove 5348

3. Physical Methods.

Photoelectric Photometry. P. R. Gleason 199
Photoelectric Photometry and Spectrophotometry. P. Fleury 200
Photoelectric Null-Method for Photometric Measurements. M. Richter 201

Photometry, *continued.*

Abstract Nos.
Applications of Photronic Cells. G. A. Shook and Barbara J. Scrivener 405
Method of Measuring the Maximum Intensity of Light from Photoflash Lamps or other Sources of Short Distance Duration. W. E. Forsythe and M. A. Easley 575
Limiting Magnitude Observable with a Photoelectric Stellar Photometer. S. Smith 926
Photoelectric Measurement of Faint Light. G. L. Locher 1011
Photometry of the Gegenschein. C. T. Elvey 1381
Recording Microphotometer. B. Lange 1459
Energy Distribution in Grating Spectra. U. Schmieschek and E. Spiller 1521
Behaviour of Neon Tubes in a Flashing Capacity Circuit. J. H. J. Poole 1594
Infra-Red Content of Daylight. G. B. Harrison 2346
Testing a Tube Sensitometer. W. S. Armstrong 2375
Photoelectric Methods in Astrophotometry. F. Löhle 2842
Accurate Measurement of Photographic Density. P. Fleury and G. A. Boutry 2971
Precision Densitometer. G. A. Boutry 2972
Measure of Weak Light Flux with the Photoelectric Cell. E. Gambetta 2974
Photoelectric Cells for Daylight Measurement. H. H. Poole and W. R. G. Atkins 2975
Direct Recording of Relative Intensities by Means of a Microphotometer. N. Thompson 2976
Selenium Rectifier Photoelectric Cells. L. Bergmann 3262
Logarithmic Protractor. H. J. Yearian 3348
Photometric Observations of Twilight. W. M. Smart 3445
Photoelectric Measurement of Reflecting Power. L. Bergmann 3508
Photoelectric Comparator for Rapid Measurement of Reflection and Transmission. C. H. Sharp and H. J. Eckweiler 3509
Use of Photoelectric Cells Coated with Fluorescent Substances, as Measuring Instruments in the Ultra-Violet. Study of the Sensitivity Curve. P. Dubouloz 3859
Photoelectric Measurement of Sky Polarisation. Z. Sekera 4013
Light Emission from Electric Spark. M. Kornetzki, V. Fomin and R. Steinitz 4066
Registering Microphotometer. W. Schütz 4067
Integrating Photometer for X-Ray Crystal Analysis. B. W. Robinson 4148
Optical Determination of the Diffusion Constant of Sodium. L. A. Ginsel and L. S. Ornstein 4342
Automatic Tracer for Light Distribution Curves. R. Sewig and W. Vaillant.. 4891
Applications of Rectifier Photoelectric Cells in Photometry. B. Lange 4892
Photometric Measurements Using Gas-Filled Photoelectric Cells. T. D. Gheorghiu 4893
Light Beam of Uniform Intensity of Cross-Section. J. T. Lay and I. C. Cornog 5303
See also 997 *under* 2; 1916, 3511 *under* 4.

4. Spectrophotometry.

Device for Augmenting the Precision of Visual Spectrophotometric Measurements. P. Vaillant 202
Dichromatic Projection Microphotometer. G. R. Harrison 203
Visual Spectroscopic Method in Heterochromatic Pyrometry. L. S. Ornstein, (Miss) J. G. Eymers and D. Vermeulen 293
Determination of Atmospheric Ozone by Visual Photometry. J. Gauzit.... 530
Quartz Capillary Arc Lamps of Bismuth, Cadmium, Lead, Mercury, Thallium and Zinc. R. M. Hoffman and F. Daniels 582
Photometric Study of Partial Lunar Eclipse of 14th September, 1932. F. Link 923
Apparatus for the Rapid Measurement of Micro-Photograms. J. Wouda.... 1012
Rapid Spectrophotometry of Liquids in the Ultra-Violet Region. F. Twyman 1460
Recording Spectrophotometer for Infra-Red. K. Liese and K. Schaum.... 1868
Spectral Photometry in the Extreme Ultra-Violet. H. Arens 1916
Absorption of Light by Solutions of Cobalt Chloride. S. B. Schwezow and A. M. Tanchilewitsch 2934
New Industrial and Research Spectrophotometer. J. H. Dowell 3510
Photoelectric Spectrophotometer. A. G. Winn 3511
Device for Reducing Grain Effects in Microphotometer Records. F. K. Richtmeyer and F. R. Hirsh, Jr. 3512
Large Crystalline Quartz Double Monochromator. W. E. Forsythe and B. T. Barnes 3610

Photometry, *continued*.

Abstract Nos.

Rapid Visual Photometric Method for Studying Atmospheric Ozone. J. Gauzit 4002
Comparison of the Transmission Bands of Metallic Silver and Colloidal Silver. P. Maréchal 4047
Photographic Photometry Methods of Measuring the Absorption of Solutions in the Visible Spectrum. F. W. Beyer 4111
Conditions for Securing Accuracy in Spectrophotometry. F. Twyman and G. F. Lothian 4474
Match-Points in Divided Beam Spectrophotometry. R. J. MacWalter and S. Barratt 4894
Determination of Mean Effective Wave-Lengths and their Application in Heterochromatic Photometry. H. Buckley 5289
See also 2377, 2378 *under* 2; 200, 201, 4892, 4893 *under* 3.

5. Standards, Units.

Black-Body Radiator for High Temperatures. C. Müller, H. Theissing and W. Esmarch 1869
Primary Standard of Light. G. Ribaud 4895

6. Unclassified.

Preparation of Circular Neutral Absorption Wedges. G. Haase 1461
Neutral Grey Liquid Filter. E. Landt 2939
Neutral Grey Liquid Filter. A. Thiel 2940
Electrical and Optical Measurements in H.F. Gas Discharges. L. Rohde and H. Schwarz 5005

Piezoelectricity.

1. Statical Phenomena.
2. Piezoelectric Oscillations.
3. Pyroelectricity.

Cross-References:
See also Section B.—Electrical Engineering.

1. Statical Phenomena.

Piezoelectric and Dielectric Characteristics of Rochelle Salt. E. Schwartz 1238
Amplifying Lever for Measurement of Small Displacements. G. A. Fink and G. W. Fox 2768
Converse Piezoelectric Effect in Mixed Crystals Isomorphous with Rochelle Salt. S. Bloomenthal 3266
Electric Properties of Isomorphous Crystals. M. Eremejew and B. Kurtschatow 3267

2. Piezoelectric Oscillations.

Temperature Variation of the Frequency of Piezoelectric Oscillations of Quartz. R. E. Gibbs and V. N. Thatte 408
Modes of Vibration of Quartz Piezoelectric Plates as Revealed by an Interferometer. W. D. Dye 409
First Piezoelectric Modulus of Quartz from Determinations with a Quartz Resonator. Angelika Székely 410
Quartz Clock for Time and Frequency Measurement of Very High Accuracy. A. Scheibe and U. Adelsberger 500
Brief Survey of Supersonics. J. C. Hubbard 677
Thickness Vibration of Piezoelectric Oscillating Crystal. I. Koga 804
Experimental Determination of the First Piezoelectric Modulus of Quartz. Berta Nussbaumer 805
Longitudinal and Flexual Vibrations of Tourmaline Plates. V. Petržilka 1239
Laue Patterns from Thick Crystals at Rest and Oscillating Piezoelectrically. J. M. Cork 1283
Triple Interferometer for Distinguishing Flexural and Longitudinal Vibrations in Quartz. H. Osterberg 1436
Absorption and Diffusion of Ultrasonic Energy. E. Paolini 1572
Multiple Interferometer for Analysing the Vibrations of a Quartz Plate. H. Osterberg 2958
Piezoelectric Properties of Tourmaline. W. Fox and M. Underwood 3265
Elastic Constants of Rochelle Salt by a Dynamical Method. R. M. Davies 3316
Motion of a Quartz Crystal in an Electrostatic Field. A. de Gramont 3863
Quartz Clocks as Timekeepers. A. Scheibe 3957

Piezoelectricity, ***continued.***

Abstract Nos.

Piezoelectric Resonator with Uniform Response for a Given Range of Frequencies. A. Guerbilsky 4289
Piezoelectric Dynamometers of the Resonance Type. A. Guerbilsky 4290
Vibrations of a Parallelepiped of Quartz. A. de Gramont 4291
Vibrating Quartz Crystals and their Sound Emission. K. Bücks and H. Müller 4292
Anomalous Dispersion of the Dielectric Constant of Rochelle Salt. G. Busch 4645
Frequency and Behaviour of the Quartz Clock of the Physikalisch-Technische Reichsanstalt. A. Scheibe and U. Adelsberger 4793
Investigation of Supersonic Waves by Means of the Resistance Thermometer. N. N. Malov 5380
Application of Methods of Geometrical Inversion to the Solution of Problems in Electrical Resonance. W. G. Cady 5487
See also 1238, 3266 *under* 1.

Planets.

1. General.
2. Major Planets.
3. Asteroids (Minor Planets).
4. Satellites (Moon, etc.).
5. Unclassified.

Cross-References :
See also Latitude and Longitude.

1. General.

Structure and Internal Motion of a Gaseous Disc as Original State of the Planetary System. H. P. Berlage, Jr. 129
Comparison of Methods of Determining Planetary Orbits. N. Stoyko 131
Effect of the Tides in Limiting the Motion of a Planetary System. G. Krall 132
Surface Brightness of an Illuminated Sphere. E. Schoenberg 922
Origin of the Solar System. F. Nölke 1366
Increase of Planet's Mass by Cosmic Dust. F. Zagar 1785, 3405
Surface Brightness of Illuminated Spheres. C. Wirtz 2850
Spectrographic Studies of the Planets. V. M. Slipher 5201

2. Major Planets.

Photographic Method of Recording the Angle of the Earth's Rotation by the Foucault Pendulum. Y. Okasaki 134
Hornsby's Observations of Mercury, 1774–1798. J. Jackson 1368
New Absorption Bands of Methane in the Ultra-Violet. R. Mecke 1503
Internal Rotation of a Heterogeneous Fluid Ring. P. Dive 2845
Absolute Motion of Solar-System and Orbital Motion of the Earth by the Ether-Drift Experiment. D. C. Miller 3366
Refraction and Diffusion in the Atmosphere of Venus. E. Schoenberg 4393
Saturn. E. Schoenberg 4797
Stability of Saturn's Rings. C. G. Pendse 5202
Rotation Period of Saturn. B. M. Peek 5203

3. Asteroids (Minor Planets).

Micrometric Measurements of Eros, 1930–1931. W. H. van den Bos and W. S. Finsen 508
Brightness and Variation of Asteroid Eros. J. Rosenhagen 2258
Colour of Eros and Southern Primary Reference Stars, and Solar Parallax Errors due to Atmospheric Dispersion. H. Horrocks 2877
Probable Number of Asteroids within Range of Discovery. B. Jekhowsky .. 4798
See also 5202 *under* 2.

4. Satellites (Moon, etc.).

Determination of Accelerations and Fluctuations in Motions of Sun and Moon. J. K. Fotheringham 524
Photometric Study of Partial Lunar Eclipse of 14th September, 1932. F. Link 923
Photometric Theory of Lunar Eclipses. F. Link 1369
Colour-Filter Photometry of Lunar Eclipse, 1931, April 2nd. N. Barabascheff and B. Semejkin 1786
Direct Measurement of the Gravitational Effect of the Moon. K. Hartley .. 2746
New Interference Micrometric Method Applicable to Double Stars and Satellites of Jupiter. A. Danjon 3398
Method of Predicting Occulations for a Given Place. W. M. Browne 3406
Motion of the Moon, 1923–1931. E. W. Brown 3969

Planets, ***continued.***

5. Unclassified.

Abstract Nos.

Number of Pieces Resulting when Fragile Balls are Broken on a Hard Plate. S. Suzuki 1314

Polarisation (Radiation).

1. Polarisation by Reflection.
2. Polarisation by Refraction.
3. Polarisation of Scattered Radiation.
4. Rotation of Plane of Polarisation. Rotatory Dispersion. Circular Dichroism.
5. Apparatus and Technique.
6. Unclassified.

Cross-References :
Dichroism, *see* Absorption and Transmission, 1.

Cross-References (contd.) *:*
Effect of Electric and Magnetic Fields, *see* Electro-Optical and Magneto-Optical Effects, 1 and 2.
Photodichroism, *see* Photochemistry (including Photography), 2(*j*).
Photoelastic Measurements, *see* Elasticity and Plasticity, 5.
Polarisation of Electric Waves, *see* Radiation, Emission, 4.

1. Polarisation by Reflection.

Variation with Angle of Emission of the Radiation from Metals Bombarded by Slow Electrons. C. Boeckner 576
Reflection of Light at a Surface Covered by a Monomolecular Film. C. Strachan 1473
Investigation of Thin Surface Films on Metals by Means of Reflected Polarised Light. L. Tronstad 2103
See also 971, 972 *under* 2 ; 4013 *under* 5.

2. Polarisation by Refraction.

Photoanisotropic Effects. T. Kondo 180, 994
Seat of the Plane of Polarisation in the Celestial Vault. A. Sinjagin 971
Polarisation of Light from the Sky. W. Smosarski 972
Pleochroism of Calcite in the Infra-red. P. le Poux 1845
Pleochroism and Birefringence of the NO_3^- Ion in Crystals. K. S. Krishnan and A. C. Dasgupta 4455
See also 2979 *under* 5.

3. Polarisation of Scattered Radiation.

Circular Polarisation of Raman Lines. Part II. W. Hanle 1071
Polarisation of Light-Scattering. S. Venkateswaran 1074
Molecular Rotation in Liquids. S. P. Ranganadham 1909
Polarisation of Light Scattering. Part II. S. Venkateswaran 1911
Testing the Polarisation of the K-Radiation of the X-Ray Fluorescence of Anisotropic Single Crystals. M. Groos 2356
Depolarisation of Light Scattered by a Uniaxial Crystal When the Optic Axis and the Scattered Ray are Parallel. J. Cabannes 3044
Theory of Depolarisation, Optical Anisotropy and the Kerr Effect. R. Serber 3484
Hyperfine Structure and the Polarisation of Resonance Radiation. Part II. Magnetic Depolarisation and the Determination of Mean Lives. A. C. G. Mitchell 3557
Polarisation of Resonance Radiation. P. Soleillet 4475
Reversal of Circular Polarisation in the Fluorescence of Thalium. W. Hanle.. 4874
Conservation of Moment of Momentum and Polarisation Rules in Spectroscopy. Application to Light Scattering and Fluorescence. A. Kastler 4876
Polarisation of the Fluorescence Light from Pure Mercury Vapour. A. Kastler 4877
Resonance Function in Collisions of the Second Kind. W. Hanle and K. Larché 5269
Depolarisation of the Raman Lines of Liquids. L. S. Ornstein and P. Stoutenbeek 5344

4. Rotation of Plane of Polarisation. Rotatory Dispersion. Circular Dichroism.

Photoelectric Method of Measuring the Rotatory Dispersions of Certain Sugars in the Near Ultra-Violet. G. Bruhat and P. Chatelain 204
Influence of Molybdates on the Rotatory Power of Xylose. E. Darmois and M. Murgier 205
Velocity and Mechanism of Racemisation of Rochelle Salt. A. N. and Alexandra J. R. Campbell 206

Polarisation (Radiation), *continued.*

Abstract Nos.

Rotation of Rochelle Salt in Alkaline Media. A. N. and Alexandra J. R. Campbell 207
Rotatory Dispersion and Circular Dichroism of Camphor-β-Sulphonic Acid in the Region of Absorption. T. M. Lowry and Helen S. French 209
Photoelectric Polarimetry. Measurements of Rotatory Dispersion of Some Sugars. G. Bruhat and P. Chatelain 1013
Racemisation of Mandelic Acid. A. N. and Alexandra J. Campbell 1014
Optical Activity and Valence Theory. C. H. Johnson 1015
Action of Aluminium Salts on Alkali Tartrates. Yeu-Ki-Heng 1462
Rotatory Power and Mutarotation of Aluminium Emetic. Pariselle 2379
Rotatory Power of Salts of Quinine in Aqueous Solution. C. Lapp 2380
Drude Theory of Optical Activity. W. Kuhn 2381
Alkali Tartrate Solutions Containing Chromium. J. P. Mathieu 2977
Studies in Solvent Action. Part VI. Optical Rotatory Powers of β-Octanol, *d*-Amyl Alcohol, and Their Derivatives. H. G. Rule, Eleanora B. Smith and J. Harrower 2978
Studies in Optical Activity. Part III. Dextro- and Laevo-Cobaltioxalates. C. H. Johnson and A. Mead 3514
Optical Rotatory Power. Part IV. Rotatory Dispersion of Bornyl and Menthyl Xanthates, Especially in the Region of Absorption. T. M. Lowry and H. Hudson 4068
Streaming Double Refraction in Critical Liquid Mixtures. W. Ostwald and H. Erbring 4728
Rotatory Dispersion and Circular Dichroism of Aldehydic Sugars. H. Hudson, M. L. Wolfrom and T. M. Lowry 4896
Nature and Extent of the Scattering Moment in Optically Active Molecules. W. Kuhn and K. Bein 4897
See also **3513** *under* **5.**

5. Apparatus and Technique.

Metallography with Polarised Light. L. Tronstad 208
Optically Stable Sugar Solutions for Colorimetric Analysis. J. F. Brewster and F. P. Phelps 2349
Photographic Measurement of Very Weakly Elliptically-Polarised Light in the Ultra-Violet. G. Szivessy, A. Dierkesmann and C. Münster 2979
Photoelectric Polarimetry. G. Bruhat and P. Chatelain 2980
Photoelectric Polarimeter. G. Bruhat and A. Guinier 2981
Studies in Optical Activity. Part II. New Type of Polarimeter. C. H. Johnson 3513
Polarising Louvres and their Application. C. F. Smith 3515
Photoelectric Measurement of Sky Polarisation. Z. Sekera 4013
Photometric Measurements Using Gas-Filled Photoelectric Cells. T. D. Gheorghiu 4893
Precise Measurement of Optical Path-Difference, especially in Stressed Glass. R. W. Goranson and L. H. Adams 5290
See also **204, 1013** *under* **4.**

Radiation, Emission.

1. Black-Body Radiation. Total Intensity and Spectral Distribution (Theoretical and Experimental).
2. Selective Radiation, Visible and Ultra-Violet Region.
3. Selective Radiation, Infra-Red Region.
4. Electric Waves :
    - (*a*) General.
    - (*b*) In Ionosphere.
5. Cosmic Rays.
6. Sources of Radiation (All Types).
7. Unclassified.

Cross-References :
Emissivity and Rate of Cooling by Combined Convection, Conduction and Radiation, *see* Convection of Heat, 3.
γ-Rays, *see* Radioactivity, 6.
Radio Communication, *see* Section B.—Electrical Engineering.
Solar Radiation, *see* Sun, 4.
Therapeutic Effects, *see* Medical Radiology and Electrology, 4.
X-Rays, *see* X-Rays, 1.

1. Black-Body Radiation. Total Intensity and Spectral Distribution (Theoretical and Experimental).

Radiation from Incandescent Oxides and Oxide Mixtures in the Visible Spectrum. H. Hoppe 1016
Total Radiation from Heated CO_2. T. Dreisch 1017
Radiation in Gaseous Explosions. W. T. David and R. M. Parkinson 1463

Radiation, Emission, *continued.*

Abstract Nos.

" Black Body " of Carbon Heated Electrically. T. N. Panay ... 1464
Simple Method for the Evaluation of Planck's Radiation Equation. H. Stoll .. 1465
Black-Body Radiator for High Temperatures. C. Müller, H. Theissing and W. Esmarch ... 1869
Determination of the Constant σ of the Stefan-Boltzmann Law of Radiation. C. Müller ... 2982
Crookes Radiometer and the Intensity of Radiation. G. Russell ... 2983
Total Radiation from Oxide Kathode. P. Clausing, and J. B. Ludwig ... 4069
Standards of Thermal Radiation Maintained by the Bureau of Standards. W. W. Coblentz and R. Stair ... 4476
See also 4895 *under* 6.

2. Selective Radiation, Visible and Ultra-Violet Region.

Variation with Angle of Emission of the Radiation from Metals Bombarded by Slow Electrons. C. Boeckner ... 576
Influence of Cold Working on the Temperature of the Commencement of Grey-glow. G. Tammann, F. Neubert and W. Boehme ... 577
Radiation from Canal Ray Impact. F. L. Verwiebe ... 3736
Initial Temperature of Grey Radiation in Metals, Oxides and Sulphides. G. Tammann and W. Boehme ... 4898
Radiation of Metal Surfaces Bombarded by Positive Alkali Ions. H. Mayer .. 5292
See also 1016 *under* 1; 215, 1020 *under* 6.

3. Selective Radiation, Infra-Red Region.

Infra-Red Radiations from Small Particles. A. H. Pfund ... 4070
Emission Constants of Metals in the Near Infra-Red. C. Hurst ... 5291

4. Electric Waves.

(*a*) *General.*
Explanation of Echoes in Space, Auroræ and Magnetic Storms. Part I. H. Dostal ... 546
Dispersion of Undamped Ulltra-Short Waves. M. Seeberger ... 1653
Slightly Damped Short Electric Waves. K. Zakrzewski and M. Miesowicz .. 2652
Heating Effects in Porous Bodies due to Short Waves. H. Bordier ... 3848
Radio Properties of the Soil. R. L. Smith-Rose ... 3434
Metallic Reflection. Part IV. Electric Waves on a Curve. I. Ebeling ... 4698
(*b*) *In Ionosphere.*
Absorption of the Debye-Falkenhagen Relaxation Force in a Neutral, Partially Ionised Gas. K. F. Niessen ... 400
Brief Review of the Physics of the Upper Atmosphere. J. Bartels ... 959
Magnetic Rotation of the Plane of Polarisation of Electromagnetic Waves in Ionised Gases. P. Keck and J. Zenneck ... 1226
Faraday Effect in Ionised Gases for Waves 4 cm. in Length. P. Keck ... 1227

5. Cosmic Rays.

Multiply-Charged Particles of Mass One. M. Delbrück ... 179
Cosmic Radiation at High Altitude. A. Piccard and M. Cosyns ... 210
Cosmic Radiation. E. Sevin ... 211
Variation of Cosmic Radiation. W. Messerschmidt ... 212, 4900
Electron Orbit in the Magnetic Equatorial Plane of the Earth. W. F. G. Swann 213
Self-Recording Cosmic-Ray Electrometer and Depth-Ionisation Curve. J. M. Benade ... 214
Cosmic-Ray Ionisation as a Function of Pressure, Temperature and Dimension of the Ionisation Chamber. J. W. Broxon ... 578
Electrons as Cosmic Rays. W. F. G. Swann ... 579
Particle Ionisation for Velocities Approaching that of Light. W. F. G. Swann and A. Bramley ... 580
Magnetic Spectrum of Ultra-Penetrating Radiation. P. Kunze ... 581
Electronic Bombardment as a Factor in Atmospheric Phenomena. W. M. Cohn 986
Registered Observations of Cosmic Radiation. J. A. Priebsch and R. Steinmaurer ... 1018
Cosmic Rays. T. H. Johnson ... 1019
Proposed Unit for Ionisation Intensities in Gases. W. Kolhörster ... 1162
Deflection of Cosmic Rays by a Magnetic Field. L. F. Curtiss ... 1466

Radiation, Emission, ***continued.***

Abstract Nos.

Dependence on Pressure and Temperature of Cosmic-Ray Ionisation. B. Gross 1467
Earth Magnetic Effect and Corpuscular Nature of Ultra-Radiation. Part IV. J. Clay 1870
Compton's Latitude Effect of Cosmic Radiation. G. Lemaître and M. S. Vallarta 1871
Mechanism of Acquirement of Cosmic-Ray Energies by Electrons. W. F. G. Swann 1872
Magnetic Deflection of Cosmic Corpuscles in the Wilson Chamber. P. Kunze 1873
Energy Stream of Cosmic Radiation. E. Regener 1874
Emanation Content of the Atmosphere, Meteorological Factors and Cosmic Radiation. W. Messerschmidt 2340
Photographs of the Tracks of Penetrating Radiation. P. M. S. Blackett and G. P. S. Occhialini 2382
Acquirement of Cosmic-Ray Energies by Electrons. W. F. G. Swann 2383
Angular Distributions of Cosmic Radiation at Elevations of 6280 ft. and 620 ft. T. H. Johnson 2384
Geographic Study of Cosmic Rays. A. H. Compton 2385
New Observatory of Cosmic Rays. L. Tuwim 2386
Interpretation of the Experimental Values for the Average Specific Ionisation of Cosmic Radiation from Measurements with the Ionisation Chamber and with the Tube Counter. W. Kolhörster and L. Tuwim 2387
Spectrum and Latitude Variation of Penetrating Radiation. E. J. Williams 2388
Action of the Earth's Magnetic Field on Penetrating Radiation. E. Fermi and B. Rossi 2984
Mathematical Theory of the Average Action of Cosmic Radiation on Open or Protected Detection Apparatus. L. Tuwim 2985
Dependence on Latitude of the Intensity of Cosmic Radiation. W. M. H. Schulze 2986
Absorption of Cosmic Radiation by the Atmosphere. E. Sevin 2987
Absorption Curve of Ultra-Radiation and Its Explanation. E. Regener 2988
New Techniques in Cosmic-Ray Measurements. R. A. Millikan 2989
Characteristics of the Penetrating Corpuscular Radiation at Sea-Level. B. Rossi 2990
Origin of Cosmic Radiation. H. Alfvén 2991
Direct Determination of the Natural Angular Distribution of Cosmic Rays. L. Tuwim 2992
Use of Argon in the Ionisation Method of Measuring Cosmic Rays and γ-Rays. J. J. Hopfield 2993
Fluctuations of Cosmic-Ray Ionisation. J. W. Broxon, G. T. Merideth and L. Strait 2994
Cosmic-Ray Intensities in the Stratosphere. I. S. Bowen and R. A. Millikan 2995
Penetrating Radiation from Thunderclouds. B. F. J. Schonland and J. P. T. Viljoen 2996
Sources of Error in Statistical Analysis. A. G. McNish 3345
Spectral Displacement of Extra-Galactic Nebulæ. F. Zwicky 3404
Transition Effects of γ-Rays. G. Guében and L. Hermans 3470
Azimuthal Asymmetry of the Cosmic Radiation in Mexico City. T. H. Johnson 3516
Investigation of Ultra-Radiation in the Wilson Chamber. P. Kunze 3517
Secondary Effects of Cosmic Radiation. E. Fünfer 3518
Analysis of the Absorption Curve of the Ultra-Radiation. E. Lenz 3519
Absorption of Ultra-Radiation. B. Gross 3520
Aeroplane Cosmic-Ray Intensity Measurements. L. M. Mott-Smith and L. G. Howell 3521
Cosmic Radiation. P. M. S. Blackett 3522
Application of Liouville's Theorem to Electron Orbits in the Earth's Magnetic Field. W. F. G. Swann 4024
Azimuthal Effect of Cosmic Radiation. M. S. Vallarta 4071
Measurements of Cosmic Radiation by a New Kind of Counting Tube. L. Tuwim 4072
Consequences of Observations on Cosmic Radiation. H. Rudolph 4073
Amplification of D.C. with a Tetrode. P. Donzelot and J. Divoux 4222
Density of Energy in the Universe. S. A. Korff 4406
Radiation Emitted at Very Rapid Collisions. W. Heitler 4477
Absorption of Penetrating Radiation by Different Elements. E. G. Steinke and H. Tielsch 4478

Radiation, Emission, *continued.*

Abstract Nos.

Straight Line Relation for Penetrating Radiation Coincidences and its Experimental Validity. W. Kolhörster and L. Tuwim 4479
Distribution of Ionising Particles of Penetrating Radiation in Relation to the Magnetic Meridian. J. P. T. Viljoen and B. F. J. Schonland 4480
Passage of Fast Corpuscles through Ferromagnetic Material. C. F. v. Weizsäcker 4481
Secondary and Tertiary Particles Produced by Cosmic Rays. J. H. Sawyer, Jr. 4482
New High-Altitude Study of Cosmic-Ray Bands and Determination of their Total Energy Content. I. S. Bowen, R. A. Millikan and H. V. Neher 4483
Cosmic-Ray Positive and Negative Electrons. C. D. Anderson 4484
Fluctuations of Cosmic-Ray Ionisation. J. W. Broxon, G. T. Merideth and L. Strait 4485
Improved Cosmic-Ray Meter. A. H. Compton and J. J. Hopfield 4486
Possible Stellar Origin of High-Speed Ions. R. Gunn 4834
Disintegration of Lead by Secondary Effects Produced by Penetrating Radiation. B. Rossi 4848
Atomic Disintegration by Penetrating Radiation. J. Barnóthy 4849
Hoffmann Collisions and Barnóthy's Theory. E. G. Steinke 4850
Neutrons. J. Perrin 4859
Cosmic Ray Light on Nuclear Physics. R. A. Millikan 4899
Absorption of Penetrating Radiation in Water and Analysis of the Absorption Function. W. Kramer 4901
Penetration Capacity and Absorption Coefficient of Ultra-Radiation. E. Lenz 4902
Dependence on Pressure of the Residual Ionisation in Cosmic Ray Measurements. P. Pfundt 4903
Dependence on Pressure of the Residual Ionisation. E. Körner 4904
Pressure Dependence of the Residual Ionisation. J. A. Priebsch 4905
Cosmic Ray Hodoscope. T. H. Johnson and E. C. Stevenson 4906
Penetrating Radiation. Irène Curie and F. Joliot 5293
Solar Activity and Cosmic Rays. V. F. Hess and R. Steinmaurer 5294
Registration of Cosmic Rays on the Hafelekar (2300 m.) at Innsbruck. Part I. V. F. Hess and R. Steinmaurer. Part II. R. Steinmaurer and H. Graziadei 5295, 5296
Cosmic Corpuscular Ultraradiation. Part V. Ionisation in the Stratosphere and in the Highest Layers. J. Clay 5297
Absorption of Cosmic Radiation. H. J. Bhabha 5298
Energy Distribution in Cosmic Rays. W. G. Pollard 5299

6. Sources of Radiation (All Types).

Electrodeless Discharge and Sources of Monochromatic Radiation. F. Esclangon 215
Quartz Capillary Arc Lamps of Bismuth, Cadmium, Lead, Mercury, Thallium and Zinc. R. M. Hoffman and F. Daniels 582
Spectra of H.F. Discharges. Part I. Comparison of Damped and Undamped Electrodeless Excitation. J. K. Robertson 590
New Monochromatic Radiator. K. Wernicke 1020
Interferential Comparison of Radiations Emitted by a New Cadmium Lamp and the Michelson Lamp. J. E. Sears, Jr., and H. Barrell 1437
Emission of Slightly Penetrating Radiation from Some Metals. J. Reboul 3523
Light Emission from Discharge Tubes. H. Krefft, M. Reger and R. Rompe.. 3540
Emission of Radiation by Chemical Reactions. R. Audubert and van Doormaal 4051
Primary Standard of Light. G. Ribaud 4895
Hydrogen Ultra-Violet Lamp. O. Darbyshire 4953
See also 4476 *under* 1.

Radiation, General Theory.

1. Classical Theory.
2. Quantum Theory.

1. Classical Theory.

Huygens' Principle. J. S. Mitchell 583
Calculation of the Long-Wave Limit of the Photoelectric Effect from the Atomic Volume of the Element. G. Schweikert 797

Radiation, General Theory, *continued.*

Abstract Nos.
Operational Theory of the Dirac Wave Equation. S. Gupta 2788
Rapid Variations of Scalar Potential in Space. R. P. J. P. del Pulgar........ 4074
See also 481 *under* 2.

2. Quantum Theory.

Atoms of Action, Electricity and Light. A. Fleming 216
Electromagnetic Field of a Light Wave. L. de Broglie........................ 481
Experimental Demonstration of the Effects of Coupling of Harmonic Motions, as Illustrating Phenomena in Quantum Mechanics. A. C. Burton....... 486
Radiation from Slow Electrons. L. Nedelsky 1021
Equilibrium between Radiation and Matter in the Universe. A. Ganguli....... 1468
Properties of Null Geodesics, and their Application to the Theory of Radiation. W. O. Kermack, W. H. M'Crea and E. T. Whittaker 1758
Simple Derivation of the Dissociation Formula. D. H. Menzel.............. 1787
Uncertainty Relations and Volume of Photons. D. Meksyn 2218
Oscillation Structure of Electron-Transfer in Polyatomic Molecules. G. Herzberg and E. Teller 3562
Explanation of the FitzGerald Contraction in Optics. A. Larmor.......... 4782
Constitution of Neutrons, Positive Electrons, and Photons. Existence of Negative Protons. J. J. Placinteanu................................ 4855
Theory of Radiation. J. Solomon.. 4907
Emission Constants of Metals in the Near Infra-Red. C. Hurst.......... 5291
Models of the Electric Field and of the Photon. J. J. Thomson............ 5462
See also 2788 *under* 1.

Radiation, Mechanical Effects.

1. Radiation Pressure.
2. Photophoresis.

Cross-References :
Radiometer Effect, *see* Kinetic Theory of Matter, 2.

1. Radiation Pressure.

Radiation Pressure by Refraction. C. Bellia.......................... 1469
Relativity Cosmogony. R. Zaycoff.............................. 1759, 2816

2. Photophoresis.

Photophoresis of Silver Particles. A. Lustig and A. Söllner.............. 1022
Motion of Suspended Particles in Glycerin and Water. J. H. Smith........ 1470
Possible Common Cause for Sub-Electronic Charge and Electrophotophoresis. K. Sitte 4075

Radioactivity.

1. Theory.
2. Radioactive Substances and Transformations.
3. Radioactive Chemistry. Preparation and Measurement of Active Sources.
4. α-Rays.
5. β-Rays.
6. γ-Rays.
7. Apparatus and Methods of Measurement.
8. Unclassified.

Cross-References :
Artificial Disintegration of Nuclei, *see* Atomic and Molecular Structure, 2.
Cosmic Radiation, *see* Radiation, Emission, 5.
Isotopes, *see* Atomic and Molecular Structure, 3.
Neutrons, *see* Atomic and Molecular Structure, 4.
Positrons, *see* Electrons, Positrons, and Protons.

1. Theory.

Passage of Hard β-Rays through Matter. C. Moller........................ 174
γ-Radiation. A. Bramley 176
Wave Mechanics Derivation of the Rutherford Formula. T. Sexl.......... 3459
Exponential Law of Radioactive Disintegration. A. E. Ruark............ 5241
See also 4844, 4864, 5248 *under* 5.

2. Radioactive Substances and Transformations.

Radium in Hungarian Rocks. S. S. de Finály.............................. 548
Period of Radium. Ellen Gleditsch and E. Foyn........................... 549
Average Life of Activated Atomic Nuclei : Probable Cases of Impossibility of γ-Ray Emission. F. Perrin 550
Origin of the Actinium Series of Radioactive Elements. A. v. Grosse..... 551

Radioactivity, *continued.*

Abstract Nos.

Radioactive Content of Rocks by the Geiger-Müller Counter. W. Vogt...... 1412
Probability and the Exponential Laws of Physics. M. C. Holmes.......... 2204
Determination of Uranium and Thorium in Rocks. H. Gräven............ 2306
Radioactivity of New Pre-Cambrian Granite of South Finland. H. Gräven and G. Kirsch.. 2307
Microscopic Investigations of a Crystal of a Morogoro Ore. H. Haberlandt 2308
Direct Fusion Method for Determining the Radium Content of Rocks. R. D. Evans.. 2309
Radium Content of Ocean-Bottom Sediments. C. S. Piggot............... 2310
Parent of Protactinium. O. A. Gratias and C. H. Collie................ 2311
New Radioactive Substances. A. Debierne.......................... 2312
Theoretical Decay Curves for Various Ratios of Radium-B to Radium-C, and of Thorium-B to Thorium-C. J. A. Cranston and C. Benson.......... 2313
Radioactivity Measurements. Part I. Radium Content of Keweenawan Basalts and Accessory Minerals. Part II. Occurrence of Radium, Uranium and Potassium in the Earth. W. D. Urry 2314
Radioactivity of a Fraction from a Neodymium-Samarium Mixture: Element 61. M. Curie and S. Takvorian 2316
Recoil Atoms. (Miss) C. Chamié................................ 2918
Radioactivity of Samarium. G. v. Hevesy, M. Pahl and R. Hosemann...... 3460
Recoil Atoms in Gaseous Media: Electronic Affinity. L. Goldstein....... 3462
Atomic Weight of Lead from Katanga Pitchblende. G. P. Baxter and C. M. Alter.. 3882
Radioactivity of Potassium. D. Bocciarelli 4026
Radioactivity of Rare Earth Elements. W. Yeh...................... 4027
Mesothorium II, Element 87. G. Guében........................... 4028
Atomic Weights of Radioactive Substances. F. Western and A. E. Ruark.... 4723
Half-Line of Actino-Uranium and Geologic Time. F. Western and A. E. Ruark 5242
Beryllium and Helium. Part I. Helium in Beryls of Varied Geological Age. (Lord) Rayleigh 5243
See also 1416, 1417, 4440 *under* 5; 1418 *under* 6; 558 *under* 7.

3. Radioactive Chemistry. Preparation and Measurement of Active Sources.

Analysis of Primary Radioactive Minerals. A. Karl..................... 988
Polonium Acetylacetonate. Servigne 1409
Effect of Gaseous Impurities on the Radiochemical Combination of Carbon Monoxide and Oxygen. C. Rosenblum 1410
Efficiency of Carbon Dioxide as a Radiochemical Catalyst. C. Rosenblum.... 1413
Factors Affecting the Ratio of Adsorption of Radium-B and Radium-C on Nickel. J. A. Cranston and C. Benson............................ 2315
Evaporation Experiments on Polonium. Elisabeth Rona................. 2317
Saturation Pressure of Radon at Low Temperatures. L. Wertenstein...... 2318
Distribution of Radium in Fractional Precipitation of Radiferous Barium Chloride. Branca E. Marques 2917
Separation of Elements 88 (Ra), 89 (Ac), and 90 (Th), by Means of Organic Solvents. M. Haissinsky 3461
Action of Radon on Unsaturated Hydrocarbons. Part III. G. B. Heisig.... 3463
Adsorption of Thorium-B and Thorium-C from Solution. Part I. J. E. King and A. Romer 3873
Radium Solutions. A. Becker 4029
New Method of Obtaining Highly Concentrated Emanation. O. Werner.... 4435
Separation of Polonium on Silver in Various Acids. O. Erbacher......... 4436
Chemical Behaviour of Polonium. O. Erbacher and H. Käding........... 4437
Purification of Radon. Nella Mortara 4840
Acceleration of Decomposition of Solids by the Emission from Radium. W. E. Garner and C. H. Moon 5244
See also 2311, 2312 *under* 2; 1859 *under* 4; 1414 *under* 5; 1411, 1844 *under* 7.

4. α-Rays.

Ionising Power of Artificial H.-Rays. K. Diebner..................... 171
Ionisation of Solid Paraffin by α-Rays. Hermine Folmer................ 172
Multiple Scattering of α-Rays Passing Through Thin Metal Foils. G. Maurer 173
Variation with Temperature of the Total Number of Conducting Carriers in Air. A. Becker and Ilsemarie Schaper............................ 552

Radioactivity, *continued.*

Abstract Nos.

Wave-Mechanical Theory of α-Particle Scattering. K. K. Mukherjee...... 1829

Influence of Grain Condition on the Blackening Sensitivity by Exposure to α-Particles. Marietta Blau and Hertha Wambacher 1859

Measurement of the Temperature of a Coal-Gas Flame by " α-Particle Method." A. Shirodkar 1951

Ranges of α-Rays of the Actinium Series. F. Rieder and Elisabeth Rona.... 2319

Measurement of the Range of α-Particles from Thorium with the Wilson Chamber. F. N. D. Kurie and G. D. Knopf...... 2320

Ionisation of Single H-Particles in Different Gases. J. Schintlmeister...... 2321

Analysis of α-Rays by an Annular Magnetic Field. (Lord) Rutherford, C. E. Wynn-Williams, W. B. Lewis and B. V. Bowden...... 2322

Relative Velocities of the α-Particles from Thorium X and its Products and from Radium C′. G. H. Briggs...... 2323

Quantitative Theory of Radioactive α-Emission. T. Sexl...... 2324

Negatively Charged H Atoms from Light Emission in the Photographic Region. R. Döpel 2541

Fine Structure of Magnetic Spectrum of α-Particles from Radioactinium and and its Derivatives. (Mme) P. Curie and S. Rosenblum 3464

α-Radiation of Radiothorium and its Derivatives. S. Rosenblum and (Miss) C. Chamié 3465

Absolute Speed of the Principal Groups of α-Particles. S. Rosenblum and G. Dupouy 3466

Collisions of α-Particles with Fluorine Nuclei. N. Feather...... 4030

Retardation of α-Particles in Hydrogen. G. Mano...... 4031

Destruction of Zinc-Sulphide Phosphors by α-Rays. R. M. Wolf and N. Riehl 4032

Temperature-Dependence of the Scintillation Process and the Destruction of Phosphors. N. Riehl 4033

Retardation of α-Particles. G. Mano...... 4438

Response of a Photographic Emulsion to α-Rays. T. R. Wilkins and R. N. Wolfe 4473

Luminescence Method of Determining the Range of α-Particles. Berta Karlik 4841

Range of α-Particles from Actinium and its Products by the Luminescence Method. Berta Karlik and Elisabeth Rona...... 4842

Analysis of Long Range α-Particles from Radium C′ by the Magnetic Focussing Method. (Lord) Rutherford, W. B. Lewis and B. V. Bowden...... 4843

Reflection of α-Particles by Heavy Nuclei. Ilse Merhaut and H. Wallner.... 5245

Long-Range α-Rays Emitted by the Active Deposit of Actinium. (Mme) P. Curie and (Miss) W. A. Lub...... 5246

Application of Probabilities to the Counting of Particles. N. I. Adams, Jr..... 5247

Proportional Amplifier for the Detection of Single Ionising Corpuscles. B. Zipprich 5407

See also 3459 *under* 1; 2311, 2313, 2316, 3460, 4027, 4028 *under* 2; 1416 *under* 5; 179, 1832, 2920 *under* 6; 557, 2931, 2932, 5015 *under* 7.

5. β-Rays.

Energy Distribution Curves of Disintegration Electrons. B. W. Sargent...... 175

β-Rays of Active Deposit of Actinium. S. Y. Sze...... 553

Absorption of β-Rays by Matter. G. Fournier and M. Guillot 989

Energy Distribution of β-Rays from Atoms of Known Age. B. W. Sargent.... 1414

Scattering of β-Rays. Part I. B. W. Sargent and A. J. O'Leary 1415

Magnetic Spectrum of β-Rays from $ThB+C+C'+C''$ and from $AcB+C+C'+C''$. S. Y. Sze 1416

Upper Limit of Energy in the β-Ray Spectrum of Actinium B. B. W. Sargent 1417

Absorption of β-Rays by Organic Compounds and the Molecular Structure of the Latter. G. Fournier and M. Guillot...... 1830

Corpuscular X-Ray Spectra of the Radio-Elements. C. D. Ellis 1927

Nuclear Scattering of β-Particles. T. Sexl...... 2325

Maximum Energy of the β-Rays from Uranium X and Other Bodies. B. W. Sargent 2326

Relation between β-Ray Absorption by Organic Compounds and their Molecular Structure. Halogen Derivatives. G. Fournier and M. Guillot...... 2327

Photographic Method of Determining Absorption of β-Rays. (Miss) R. Macaigne 3468

Investigation of the Radiations from RaD, Using the Wilson Method. G. v. Droste 4034

Radioactivity, *continued.*

Abstract Nos.

Magnetic Spectrum of β-Rays from Actinium. T. Graf 4439
β-Radiation of Radium E and the Active Deposit of Actinium. M. Lecoin 4440
Theory of β-Ray Disintegration. K. Sitte 4441
Energy Relations in the β-Ray Type of Radioactive Disintegration. C. D. Ellis and N. F. Mott 4442
Energy Principle and Reversibility of the Elementary Processes. G. Beck 4443
Energy of β-Rays and Law of Conservation of Energy. M. Hayakawa 4844
Colouring and Decolouring of Compressed Rock-Salt. Magdalene Haberfeld .. 4864
Theory of the β-Disintegration. G. Beck and K. Sitte 5248
See also 174 *under* 1; 4026 *under* 2; 179, 554, 990, 991, 1162, 1418, 1832, 4444, 4846 *under* 6.

6. γ-Rays.

Absorption and Scattering of Hard γ-Rays. C. Y. Chao 177
Calculation of Scattering Correction of γ-Rays. G. T. P. Tarrant 178
Multiply-Charged Particles of Mass One. M. Delbrück 179
γ-Rays of Thorium B and Thorium C Bodies. C. D. Ellis 554
Internal Conversion Coefficient for Radium C. H. R. Hulme 990
Theory of Internal Conversion of γ-Rays. H. M. Taylor and N. F. Mott .. 991, 4846
Proposed Unit for Ionisation Intensities in Gases. W. Kolhörster 1162
γ-Rays from ThC and ThC″ and the Fine Structure of the α-Rays. Lise Meitner and K. Philipp 1418
Anomalous Absorption of γ-Rays. (Possibility of the Quantum Jump of the Rest-Mass of an Electron.) B. Arakatsu 1831
Internal Conversion of γ-Rays and Nuclear Level Systems of Thorium B and C. C. D. Ellis and N. F. Mott 1832
γ-Rays Produced during the Disintegration of Lithium. H. R. v. Traubenberg, A. Eckardt and R. Gebauer 1834
Structure of Atomic Nuclei. W. Heisenberg 1842
γ-Ray and X-Ray Spectra of the Thorium Family. M. Valadares 2328
Positive Electrons. Irène Curie and F. Joliot 2919
Radiation Excited by α-Particles in Fluorine. P. Savel 2920
Theory of the Nucleus. E. N. Gapon 2924
Use of Argon in the Ionisation Method of Measuring Cosmic Rays and γ-Rays. J. J. Hopfield 2993
Nuclear Diffusion of γ-Rays. E. Stahel and H. Ketelaar 3469
Transition Effects of γ-Rays. G. Guében and L. Hermans 3470
Secondary Effects in Ionisation by Hard γ-Rays. E. J. Workman 3471
Origin of Positive Electrons. Irène Curie and F. Joliot 3473
γ-Ray and X-Ray Spectra of the Radium Family. M. Valadares 4035
Biological Response to γ-Rays of Radium as a Function of the Intensity of Radiation. F. G. Spear and L. G. Grimmett 4276
Internal Conversion. J. Solomon 4444
Scattering of Short-Wave γ-Radiation. L. Meitner and H. Kösters 4445
Absorption of very Penetrating γ-Rays. W. Gentner 4446
Scattering of γ-Rays in Air and Water. W. J. Rees and L. H. Clark 4845
Effect of Internal Conversion. J. Solomon 4847
Penetrating γ-Rays from Actinium. (Mme) P. Curie and P. Savel 5249
Interaction between γ-Rays and Atomic Nuclei. E. Stahel and H. Ketelaar .. 5250
See also 176 *under* 1; 550, 4026 *under* 2; 1416, 4034 *under* 5; 993, 3156 *under* 7.

7. Apparatus and Methods of Measurement.

Use of the Wilson Cloud Chamber for Measuring the Range of α-Particles from Weak Sources. F. N. D. Kurie 557
Point Discharge Method of Measurement of the Radioactivity of the Atmosphere. G. Aliverti 558
Design of Pressure Ionisation Chambers. J. H. Williams 714
γ-Ray Method for Measuring the Radium Content of Minerals. F. Běhounek .. 993
Apparatus for the Purification of Radon. R. Livingston 1411
Atmospheric Radioactivity. G. Aliverti 1424
Amplification of the Ionisation Produced by Radioactive Sources. J. A. C. Tegan 1844
Temperature Effect and its Elimination in Geiger-Müller Tube Counters. L. F. Curtiss 2002
Apparatus for the Measurement of Radioactive Materials. A. Piccard and L. Meylan 2339

Radioactivity, *continued*.

Abstract Nos.
Emanation Content of the Atmosphere, Meteorological Factors and Cosmic Radiation. W. Messerschmidt 2340
Circuit for Recording Multiply-Coincident Discharges of Geiger-Müller Counters. T. H. Johnson and J. C. Street 2546
Direct Measurement of Intensities of Fine Structure of α-Particles. S. Rosenblum and P. Chevallier 2931
Magnet for α-Ray Spectroscopy. J. D. Cockcroft 2932
Technique for Determination of Radioactive Content of Liquids. R. D. Evans 2933
Temporary Activation of Geiger-Müller Counters after Treatment with X-Rays. R. Brunetti and Z. Ollano 3153
Spread of the Discharge in Geiger-Müller Counters. F. Greiner 3154
Influence of the Walls on the Discharge of the Tube Counter. J. N. Hummel 3155
Application of the Electrometer Triode to the Measurement of Ionisation Current. J. A. C. Teegan and A. M. Hayes 3156
Electrometer Triode in the X-Ray Ionisation Spectrometer. W. A. Wooster and B. W. Robinson 3157
New Electroscope for Hospital Use. L. G. Grimmett 3245
Radioactive Contamination of Ionisation Chamber Materials. J. A. Bearden 3467
Vertical, Vacuum, Split-Tube, Graphite-Resistance Furnace. R. D. Evans 3684
New Experimental Arrangement for the Production of Fast Ions. H. Kallmann 4206
Resistance-Coupled Amplifier for Measuring Ionisation Currents. L. F. Curtiss 4221
Amplification of D.C. with a Tetrode. P. Donzelot and J. Divoux 4222
Dependence on Pressure of the Residual Ionisation in Cosmic Ray Measurements. P. Pfundt 4903
Dependence on Pressure of the Residual Ionisation. E. Körner 4904
Pressure Dependence of the Residual Ionisation. J. A. Priebsch 4905
Cosmic Ray Hodoscope. T. H. Johnson and E. C. Stevenson 4906
Wilson Chamber as a Counting Apparatus for α- and H-Rays. R. Trattner 5015
Extension of Limits of Application of the Duant Vacuum Electrometer. K. Diebner 5061
Large Plate Condenser Method of Measuring Radioactive Substances. (Mme) P. Curie 5260
See also 1412, 2306, 2308, 2309, 4028 *under* 2; 2315, 2318, 3873, 4435 *under* 3; 173, 2319, 2320, 2321, 2322, 2323, 4841, 4842, 4843 *under* 4; 177, 554, 2328, 2993, 3471, 4035 *under* 6.

8. Unclassified.

Mobilities of Molecular Aggregates in Gases Containing Radon. E. L. Harrington and E. O. Braaten 1421
Radioactive Phenomena of the Second Order, Artificially Induced. G. Reboul 2341
Radioactivity of Well Waters from Dumfries. J. Muir 2916
Application of ThB, the Radioactive Isotope of Pb, in Metallurgy. G. Tammann and G. Bandel 4863
Cooling of a Radioactive Sphere. A. N. Lowan 5230

Reflection, Refraction and Dispersion (Radiation).

1. Reflection, Reflecting Power.
2. Geometrical Optics. Optical Imagery.
3. Aberration (Spherical and Chromatic), Tests for Definition, Distortion, Astigmatism, etc.
4. Refraction and Refractive Indices.
5. Dispersion.
6. Glasses, Optical Media and Materials.
7. Apparatus and Instruments:
    - (*a*) Mirrors, Microscopes and Telescopes.
    - (*b*) Refractometers.
    - (*c*) Goniometers.
    - (*d*) Projectors (Lighthouses, Lanterns, etc.).
    - (*e*) Lenses, Objectives, Prisms, Eyepieces.
    - (*f*) Unclassified.
8. Unclassified.

Cross-References:
Double Refraction in Magnetic and Electric Fields, *see* Electro-Optical and Magneto-Optical Effects, 1.
Electric Waves, *see* Radiation, Emission, 4.
γ-Rays, *see* Radioactivity, 6.
Meteorological Optics, *see* Meteorology, 6.
Photoelastic Measurements, *see* Elasticity and Plasticity, 5.
Spectrophotometers, *see* Photometry, 4.
Spectroscopic Apparatus, *see* Spectroscopy, 9.
X-Ray Reflection, etc., *see* X-Rays, 5.

1. Reflection, Reflecting Power.

Total Reflection at a Semi-Silvered Glass Surface. A. de Gramont 217
Visual Spectroscopic Method in Heterochromatic Pyrometry. L. S. Ornstein, (Miss) J. G. Eymers and D. Vermeulen 293

Reflection, Refraction and Dispersion (Radiation), *continued.*

Abstract Nos.

Change of Reflectivity of Bismuth due to Magnetisation. E. Englert and K. Schuster 584
Metallic Films and Surfaces. K. Richter 843
Absorption and Dispersion of Celluloid between 300 and 1000 Å. H. M. O'Bryan 995
Reflection and Refraction by Transparent Materials. W. Hartwig and A. Johnsen 1023
Optical Constants of Transparent Silver. H. Murmann 1425
Reflecting Power of Very Thin Films of Metals. P. Rouard 1471
Preparation of Residual-Ray Plates and the Reflection Power of Powders. R. B. Barnes 1472
Reflection of Light at a Surface Covered by a Monomolecular Film. C. Strachan 1473
Optical and Photoelectric Investigations of Thin Metallic Films. R. Schulze 1657
Variation of Phase by Reflection from Thin Metallic Films. P. Rouard 1875
Investigation of Thin Surface Films on Metals by Means of Reflected Polarised Light. L. Tronstad 2103
Testing of Reflectors. S. Wachowski 2390
Reflective Power and Bireflection of Nickel Arsenide. W. Faber 2997
Photoelectric Measurement of Reflecting Power. L. Bergmann 3508
Variation of Phase by Reflection from Very Thin Metallic Films. P. Rouard 3524
Determination of the Reflective Power of Metals in the Visible and Ultra-Violet Region. K. v. Fragstein 3525
Polish on Metals. R. C. French 3526
Remarkable Optical Properties of the Alkali Metals. R. W. Wood 4456
Visibility of Objects in a Searchlight Beam. W. M. Hampton 4545
Emission Constants of Metals in the Near Infra-Red. C. Hurst 5291
Nature of Polish Layers. J. A. Darbyshire and K. R. Dixit 5300
See also 2391 *under* 2; 1438 *under* 4.

2. Geometrical Optics. Optical Imagery.

Mach Effect and Law. B. Demetrovic 218
Mach Effect. F. Wolfers 219
Diagrams of a Surface Element in Rotating Systems. H. Boegehold and M. Herzberger 220
Isoplanatic Diagrams by Means of Optically-Centred Systems. E. Lihotzky 221
Image Formation of Non-Self-Luminous Objects. C. Münster 1024
Geometrical Optics of Aspherical Surfaces. H. R. Schulz 1474
Light Rays and Wave Surfaces in General Anisotropic Bodies. P. Frank 1475
Wentzel Approximation Process in the Relativity-Dynamics of the Electron. K. Bechert 1748
Geometrical Optics. C. W. Oseen 1876
Error of Direction Produced by a Glass Mirror. V. Theimer 2391
Theory of the Representation of Errors of the Third Order. H. Schwerdtfeger 2998
Geometrical Optics in Inhomogeneous Media. J. Picht 3527
Property of the Refraction of Pencils of Light Rays. A. Dargenton 4076
Measurement of Focal Lengths. A. Biot 4077
Optical Imagery. J. Picht 4078
Method of Projecting Star Images Having Coma and Astigmatism. R. Kingslake and A. B. Simmons 4079
New Optical Experiment and Use of Single Lens for High Magnification; Observation of Entoptic and Diffraction Phenomena. J. G. Winans 4080
Optical Theory of Non-Homogeneous Medium. M. Herzberger 5301
Deviations of an Inclined Beam of Finite Aperture in the Meridian Section of a Centred Lens System. A. W. Tronnier 5302
Light Beam of Uniform Intensity of Cross-Section. J. T. Lay and I. C. Cornog 5303

3. Aberration (Spherical and Chromatic), Tests for Definition, Distortion, Astigmatism, etc.

"Aberrations of Coma" in Beams of Large Inclination. F. Croze 2392
Axial Chromatic Aberration in an Objective Lens. W. Herriott 2999
Astigmatism of the Concave Grating. G. H. Dieke 4055
Astigmatism and Curvature of Field in Wide-Aperture Optical Systems. E. Lihotzky 4081

Reflection, Refraction and Dispersion (Radiation), *continued.*

Abstract Nos.

Aberrations of the Concave Grating at Large Angles of Incidence. I. S. Bowen 4544

See also 2390 *under* 1 ; 220, 221, 1876, 4077 *under* 2 ; 1030, 2840 *under* 7 (*a*).

4. Refraction and Refractive Indices.

Tension Double Refraction of Colloids in Solution. W. Kuhn 19
Determination of the Relationship between Wave-Lengths of Light and the Fundamental Standards of Length. J. E. Sears, Jr., and H. Barrell 79
Refractivities of Binary Mixtures of Benzene. A. R. Martens and B. Collie 222
Total and Specific Heats of a Series of Fractions of Petroleum, and their Relation to Other Properties. Parts IX-XII. H. R. Lang and R. Jessel 275
Optical Properties of Carbonates. H. Brasseur 440
Refraction of Gaseous Acetaldehyde and Ethyl Acetate. H. Lowery, H. C. Poole and C. Isherwood 585
Vacuum Apparatus for Measuring Thermal Expansion at Elevated Temperatures, with Measurements on Pt, Au, Mg and Zn. J. B. Austin 649
Lorentz-Lorenz Correction in Metallic Conductors. R. de L. Kronig and H. J. Groenewold 718
Photoanisotropic Effect in Dyes. T. Kondo 180, 994
Specific Exaltation of Molecular Refraction and Dispersion. E. Hückel 1025
Refractive Indices of Liquid Mixtures with Benzene as one Component. N. A. Puschin and P. G. Matavulj 1026
New Empirical Formula for the Determination of Indices of Refraction. A. Biot 1027
Relations between the Refractive Indices and the Behaviour of Cellulose Fibres. J. M. Preston 1272
Photographic Method of Deriving the Optical Constants of Metals. S. E. Williams 1438
Pauly Method of Determining Refractive Indices of Liquids. F. C. Phillips and W. A. Wooster 1476
Atomic Radius of Carbon in Diamond. V. Posejpal 1671, 3292
Diaminozinc Bromide : Crystallographic Study. S. Kozik 1688
Description and Structure of Lithium Hydroxide. T. Ernst 1691
Binary Liquid Systems and the Mixture Rule. W. MacFarlane and R. Wright 1701
Influence of Dispersion on the Indications of the Haber-Löwes Gas Interferometer. E. Karwat 1852
Diamagnetic Susceptibility and Refraction According to Wave Mechanics. B. Mrowka 2060
Quantitative Interpretation of the Viscosity and Double Refraction of Flowing Suspensions. W. Kuhn 2122
Crystal Structure of Silver Per-rhenate. F. Buschendorf 2143
Capillary Depression of Mercury in Cylindrical Tubes and Errors of Glass Manometers. W. Cawood and H. S. Patterson 2242
Refractive Indices of Ammonium Nitrate. S. B. Hendricks, W. E. Deming and M. E. Jefferson 2393
Refractive Indices of Liquid Mixtures with Pyridine as Component. N. A. Puschin and P. G. Matavulj 2394
Refractivity of Para-Hydrogen. C. and Maude Cuthbertson 2395
Measurement of Gradual Variations of Refractive Index. A. Biot 2396
Simple Method of Determining the Refractive Index of a Liquid. S. C. Gladden 2397
Molecular Refraction in Dilute Solutions. Part I. Differential-Buoyancy Method for Accurate Density Measurements. W. Geffcken, C. Beckmann and A. Kruis 2398
Dispersion of Optical Glasses. A. Biot 2399
Spectro-Chemistry of Pyridine and Pyridone Derivatives. K. v. Auwers 2400
Significance of the Specific Exaltation of Molar Refraction and Molar Dispersion. K. v. Auwers 2401
Wave Mechanical Theory of Refraction. J. A. Wasastjerna 2797
Electron Distribution in Atoms and Ions. J. A. Wasastjerna 2798
Refractive Indices of Solid Bodies. A. Biot 3000
Molecular Refraction of Alums. K. Wendekamm 3001
Composition and Structure of Artificial Spherulites. H. W. Morse, J. D. H. Donnay and E. Ott 3302
Studies in Refractive Index. Parts I and II. A. M. Taylor and A. M. Glover. Part III. A. M. Taylor and Dorothy A. Durfee. Part IV. A. M. Taylor and A. King 3528, 4083, 4488

Reflection, Refraction and Dispersion (Radiation), ***continued*****.**

Abstract Nos.

Double Refraction in Streaming Solutions of Molecular Colloids. R. Signer and H. Gross 3888
Crystallography of Compounds of Gadolinium and Samarium. A. Pabst 3899
Ray-Surface and Optical Indicatrix. G. Tunell 4082
Crystal Lattice and Calculated Refractive Indices of Sodium Hydrogen Carbonate. W. H. Zachariasen 4330
Pleochroism and Birefringence of the NO$_3$ Ion in Crystals. K. S. Krishnan and A. C. Dasgupta 4455
Optical Anisotropy of Molecular Crystals. Part I. Experimental. S. B. Hendricks and M. E. Jefferson 4487
Streaming Double Refraction in Critical Liquid Mixtures. W. Ostwald and H. Erbring 4728
Optical Properties, Densities, and Solubilities of the Normal Formates of Some Metals of Group II of the Periodic System. F. W. Ashton, D. F. Houston and C. P. Saylor 4908
Optical Properties of the Double Salt $(NH_4)_2 SO_4, CaSO_4, 2H_2O$. A. R. Merz, J. O. Hardesty and S. B. Hendricks 4909
Rotating Chamber for the Determination of Refractive Indices of Solutions by Interferometry. A. Kruis and W. Geffcken 4910
Refractive Index of Quartz in Infra-Red. C. Müller and A. Wetthauer 5304
Theory of Forced Double Refraction. K. F. Herzfeld and R. H. Lee 5305
See also 995, 1023, 2997, 4456 *under* 1; 2391, 4076 *under* 2; 1877, 4489, 4911 *under* 5; 1029 *under* 6; 4492 *under* 7 (*e*).

5. Dispersion.

Dispersion of Gases and Vapours and Representation by the Dispersion Theory. Part III. Dispersion of Oxygen between 6000 Å and 1920 Å. R. Ladenburg and G. Wolfsohn 586
Scattering of Light by Sound Waves. P. Debye 679
Dispersion with Triple-Prism Combinations. H. R. Schulz 1028
Theory of the Dispersion and Absorption of Helium. J. A. Wheeler 1877
Continuous Absorption of Oxygen Between1 750 and 1300 Å and its Bearing Upon the Dispersion. R. Ladenburg and C. C. van Voorhis 2438
Quantum Theory of Dispersion. Parts VI and VII. G. Breit 3002
Magneto-Optical Dispersion of Organic Liquids in the Ultra-Violet. Part V. Normal Propyl Propionate, Isobutyl Acetate, Ethyl Acetoacetate and Ethyl Oxalate. A. de M. Beanland and E. J. Evans 3491
Magneto-Optical Dispersion of Acetic Acid and Normal Propyl Acetate. W. J. Lewis and G. E. Jones 3492
Absorption Bands and Dispersion of Potassium Chloride. P. Wulff 3529
Dispersion in the Visible and Ultra-Violet. P. Wulff 3530
Dispersion of Gases and Vapours. Part IV. Dispersion of Mercury Vapour between 2800 and 1890 Å. G. Wolfsohn 3531
Dispersion of Light in the Neighbourhood of Quadripole Lines. J. Blaton 3560
Experiment on Dispersion. R. C. Evans 4489
Dispersion Measurements upon Potassium Bromide and Potassium Iodide in the Infra-Red. K. Korth 4490
Dispersion Measurements on Sodium Chloride in the Long Wave Infra-Red. C. H. Cartwright and M. Czerny 4911
Dispersion of Gases and Vapours. Part V. Interferometer for Schumann Region. G. Wolfsohn 4912
Absorption of NaCl, KCl and KI in the Far Ultra-Violet. A. Smith 4946
Continuous Absorption Spectrum of Helium. J. P. Vinti 4947
Resonance Lines of Silver. A. Filippov and I. Islamov 5309
See also 2103 *under* 1; 1025, 1027, 1852, 2395, 2399, 2400, 2401, 4908 *under* 4; 1029 *under* 6; 1479 *under* 7 (*e*).

6. Glasses, Optical Media and Materials.

Atomic Arrangement in Glass. W. H. Zachariasen 30
Mechanical Engineering Applied to the Making of Lenses. W. Taylor 587
Relation between the Composition and the Density and Optical Properties of Glass. Part I. Soda-Lime-Silica Glasses. G. W. Morey and H. E. Merwin 1029
Density of Soda-Lime-Silica Glasses as a Function of the Composition. F. W. Glaze, J. C. Young and A. N. Finn 1306

Reflection, Refraction and Dispersion (Radiation), *continued.*

Abstract Nos.

Colour Filters for Altering Colour Temperature. Pyrometer Absorption and "Daylite" Glasses. H. P. Gage 1867
Luminescence and Crystal Structure. B. E. Cohn 2359
Absorption of Cobaltous Compounds. Part IV. Alkali Oxide Boric Oxide Glasses. W. R. Brode 2422
Phase Equilibrium Relationships Determining Glass Compositions. G. W. Morey 4084
Critical Temperatures in Silicate Glasses. J. T. Littleton 4085
Chemical Composition of Commercial Glasses. D. E. Sharp 4086
Annealing of Glass as a Physical Problem. L. H. Adams 4156
Viscosity of Optical Glass. W. H. Wadleigh 4491
Volatilisation from Potassium Oxide-Silica Glasses. E. Preston and W. E. S. Turner 4580
Vapour Tension of BaO, SrO and CaO and their Mixtures deduced from Measurements of the Rates of Evaporation. E. Preston 4596
X-Ray Diffraction and the Structure of Glasses. J. T. Randall and H. P. Rooksby 5126
Strength of Glass. J. B. Murgatroyd 5143
Stresses in Flashed Glasses. W. M. Hampton 5144
Behaviour of Glass when Slowly Heated with Special Reference to the Thermal Expansion. E. Seddon and W. E. S. Turner 5365
Thermal Expansion of Silica-Soda-Beryllia Glasses. E. Rencker 5366
Physical Properties of Glasses of the $SiO_2 — Na_2O — K_2O — CaO$ System. W. Hänlein 5367
See also 2399 *under* 4; 1030 *under* 7 (*a*).

7. Apparatus and Instruments.

(*a*) *Mirrors, Microscopes and Telescopes.*

Synchronous Motor Operation of Astronomical Telescopes. G. W. Moffit 122
Telescopes with Micrometer Cross-Wires. W. Uhink 223
Universal Vertical Illuminator for Microscopes. J. Flügge 224
Deformation of Large Astronomical Mirrors. A. Couder 1030
Improvements in Microphotography with Ultra-Violet Light. A. Köhler 1864
"Univertor" Principle in New Form. J. Flügge 1878
Use of Bubble Sextant at Sea. E. O. Hulburt 2248
New Measuring Eyepiece. H. Wedemeyer 2402
Construction of a Telescope Mirror of 1·20 m. Diameter. A. Couder 2840
Astrometry with Mirrors and Lenses. F. E. Ross 2841
Evaporated Films for Large Mirrors. R. C. Williams and G. B. Sabine 3532
Immersion Microscope Objective for Use with Wave-Length 214 $m\mu$. B. K. Johnson 3533
Optical Tests of the 69-Inch Perkins Observatory Reflector. H. T. Stetson 3964
Determination of the Magnitude of Ultramicrons with the Interference Microscope. A. Klimmeck 4879
Toronto University 74-inch Reflecting Telescope 5195
See also 2390 *under* 1; 2391, 4080 *under* 2; 226, 227 *under* 7 (*c*).

(*b*) *Refractometers.*

Geometry of the Jamin Refractometer. S. E. Green 1031
New Universal Refractometer with Internal Reading. P. Lob 1477
Interferometry. Part II. Construction, Testing and Use of Reflection Échelons for Visible and Ultra-Violet Regions. W. E. Williams 4466
Theory and Use of Interference Refractometer. H. Schardin 5279
See also 2397, 2398 *under* 4; 4492 *under* 7 (*c*).

(*c*) *Lenses, Objectives, Prisms, Eye-Pieces.*

New Wide Angle Objective. H. Schulz 226
Correcting Lenses for Refractors. F. E. Ross 227
Defects of Large Aperture Objectives. G. Bonnerot 1478
Advantages and Disadvantages of the Dispersion in the Plate Prism of the Lummer-Gehrcke Plate. Magdalena Adam 1479
Calibration of an Infra-Red Spectrometer with a Rock-Salt Prism. P. C. Cross 2452
Impersonal Astrolabe. H. Chrétien 3396
Apparatus for Measuring the Absolute Personal Equation in Prism Astrolabe Observations. E. Chandon, (Mrs.) R. de Volontat and A. Gougenheim 3397

Reflection, Refraction and Dispersion (Radiation), *continued.*

Abstract Nos.
Prism Surface Planity and Collimation in Precise Minimum-Deviation Refractometry. L. W. Tilton 4492
See also 2999 *under* 3; 1028 *under* 5; 587 *under* 6; 2841 *under* 7 (*a*).
(*f*) *Unclassified.*
Optical Screen for Demonstrations. J. H. Howey 1032
Progressive Lightning: New Steroscope. C. V. Boys 2299
Photoelectric Comparator for Rapid Measurement of Reflection and Transmission. C. H. Sharp and H. J. Eckweiler 3509
Sectometer: New Optical Method of Testing the Microtom-Measurer. H. Elpel 4493
Source of Error in Measurement of Transmission of Optical Instruments. B. Cuny 4913
See also 3528, 4082, 4083, 4488 *under* 4; 586 *under* 5.

8. Unclassified.

New Method of Measurement of the Thickness of Metal Films. S. Tanaka 1879
Artificial Rainbow. U. P. Lely 3003

Relativity and Ether.

1. Special (or Restricted) Theory of Relativity.
2. General Theory of Relativity.
3. Unitary Field Theory.
4. Unclassified.

Cross-References:
Cosmology, *see* Cosmogony.

1. Special (or Restricted) Theory of Relativity.

Dirac's New Field Theory. S. Schubin 87
Einsteinian Correction of Time in a Planetary Motion. M. Cimino 487
Experimental Establishment of the Relativity of Time. R. J. Kennedy and E. M. Thorndike 488
Esclangon Effect is Ether Drift Observed by Miller at Mount Wilson. E. Carvallo 492
Clock Problem in Relativity. J. W. Campbell 1344, 4781
Larmor-Lorentz Transformation. O. J. and A. Lodge 2228
First Twenty-Five Years of Relativity. R. Marcolongo 2805
New Form of Michelson's Experiment. A. Sesmat 2953
Relativistic Partition of Energy in Gases. P. E. Böhmer 3340
Absolute Motion of Solar System and Orbital Motion of the Earth by the Ether-Drift Experiment. D. C. Miller 3366
Theory of Secular Aberration. Y. Hagihara 3943
New Form of Lorentz Formulæ. J. le Roux 4376
Explanation of the FitzGerald Contraction in Optics. A. Larmor 4782
Ether Hypothesis due to Poincaré. J. Leroux 5174
See also 3365 *under* 3.

2. General Theory of Relativity.

Dirac's Equation in General Relativity. G. C. McVittie 86
Theory of Electric Charge. A. S. Eddington 92
Linearity of the Lorentz Transformations. M. H. A. Newman 489
Kaufmann-Bucherer Experiments and a Classical Einsteinian Mass Formula. A. Press 754
Formulæ for Apparent Displacement of Stars by the Sun's Gravitational Field. N. Stoyko 894
World-Structure and the Expansion of the Universe. E. A. Milne 1347
E. A. Milne's Theory of the Expansion of the Universe. E. Freundlich 1348
Hornsby's Observations of Mercury, 1774–1798. J. Jackson 1368
Properties of Null Geodesics, and their Application to the Theory of Radiation. W. O. Kermack, W. H. McCrea and E. T. Whittaker 1758
Quantum Theory in General Relativity. V. Bargmann 2226
Semi-Vectors and Spinors. A. Einstein and W. Mayer 2227
Determinism in the Natural Sciences. J. Metallman 2229
Metrics Employed in Einstein's Theory. J. Delsarte 2230
Contribution to the Cosmological Problem and the Problem of the Propagation of Light in Gravitational Fields. M. Kohler 2234
Non-Static Riemannian Manifolds with Axial Symmetry. J. Delsarte 2806

Relativity and Ether, *continued.*

Abstract Nos.
Mechanical Interpretation of Levi-Civita's Parallelism. M. Haimovici 2808
Theory of the Bending of Light Rays by the Sun. E. Freundlich and A. v. Brunn 2809
Definition of Distance in General Relativity. I. M. H. Etherington 2810
Geometry of Two-Component Spinors. O. Veblen 2811
Milne's Theory of the Expansion of the Universe. G. C. McVittie 2820
Thermodynamics and Relativity. R. C. Tolman 3115
Measurement of Spatial Distance in a Curved Space-Time. H. S. Ruse 3367
Incompatibility of the Riemannian Concept of Space with The Principle of Relativity. J. le Roux 3368
Geometry of Four-Component Spinors. O. Veblen 3371
Theory of Spinors. K. Nikolsky 3372
Class of Solutions of Einstein's Gravitational Equations. C. Racine 3944
Milne's Theory of World Structure. W. O. Kermack and W. H. McCrea 3947
Dirac's and Schrödinger's Equations. T. Levi-Civita 4371
Wave Equation of the Electron in the General Relativity Theory. L. Infeld and B. L. van der Waerden 4372
Dirac Equations in the Case of Semi-Vectors. A. Einstein and W. Mayer 4783
Fission of the Most Natural Field Equations for Semi-Vectors into Spinor Equations of Dirac Type. A. Einstein and W. Mayer 4784
See also 2805 *under* 1 ; 3946 *under* 3.

3. Unitary Field Theory.

Riemannian Manifolds and Non-Euclidean Space-Forms. P. Koebe 100
Einstein and Mayer's Theory and Dirac's Equations. J. Solomon 101
Unitary Field Theory. J. A. Schouten and D. van Dantzig 102
Unitary Field Theory and Dirac's Equation. J. A. Schouten and D. van Dantzig 103
Unitary Field Theory. J. A. Schouten and D. van Dantzig 104
Existence of a Metric and the Inverse Variational Problem. D. D. Kosambi 490
Dirac's Equations and the Unitary Theory of Einstein and Mayer. W. Pauli and J. Solomon 491
Unitary Field Theory and Dirac's Equations. W. Pauli and J. Solomon 1345
Gravitation and Electricity. Part II. Irene E. Viney and Grace G. Leybourne. Part III. H. F. Willis 1346
Application of Riemannian Geometry of Complex Space to Wave-Mechanical Problems. U. Kakinuma 1752
Fundamental Affine Geometry of Unified Field Theories. D. D. Kosambi 2231
Unitary Field Theory. J. A. Schouten 2232
Riemann's Homography Relative to a Curved Space. T. Boggio 2807
Straneo's Unitary Theory. A. de M. Fernandes 2812
Space-Time in the Unitary Field Theory. J. A. Schouten 2813
Projective Relativity and the Einstein-Mayer Unified Field Theory. B. Hoffmann 2814
Connection between Field and Matter. R. Zaycoff 2815
Combination of the Equations of Newton, Fresnel and Maxwell. E. Sevin 3365
Unitary Principle Linking Relativity, Gravitation and the Discreteness of Quanta. A. Press 3369
Theory of Gravitation and Electromagnetism. H. P. Soh 3945
General Field Theory : Semi-Vectors and Spin Space. J. A. Schouten 3946
Interpretation of Einstein's Unified Field Theory. W. H. McCrea 4785
Gravitational Field of the Electron. J. Ghosh 5175
Formulation of the Laws of Nature in Terms of Five Homogeneous Coordinates. W. Pauli 5176
Integral Theory of Field and Matter. R. Zaycoff 5177
See also 2805, 3366 *under* 1.

4. Unclassified.

Space-Structure and Motion. G. Strömberg 493
Theory of Electron Spin. S. Shimasaki 1747
Radial Motion of a Spherical Aggregate of Matter. J. Delsarte 2236
Interpretation of Heat in Relativistic Thermodynamics. R. C. Tolman and H. P. Robertson 2497
Atomistic Conception of Space and Time. L. Schames 2823
Space-Time Scale as a Quantum Coordinate System. W. Bender 4363
Models of the Electric Field and of the Photon. J. J. Thomson 5462

For the **Key** to this Index see pp. 1358 to 1372.

Seismology.

1. Theory.
2. Observational.
3. Apparatus and Technique.

Cross-References :
Earth Tides, *see* Land, Physics of the, 5.

1. Theory.

Abstract Nos.

Stresses Near Surface of Cavity in Gravitating Solid. G. Nishimura and T. Takayama 151
Plasticity and Creep in Solids. H. Jeffreys 454
Gravity in the Atlantic Area. F. A. V. Meinesz 979
Reflection and Refraction of Seismic Waves. K. Sezawa and K. Kanai 980
Earth Structure. E. A. Hodgson 1384
Depths of the Earth. R. A. Daly 1385
Earthquakes and Variation in Latitude. H. Nagaoka 1395
Two-Dimensional Elastic Wave due to Double Source. S. Higuchi 1711
Theory of Refraction Shooting. M. Muskat 1805
Studies in Reflected Seismic Waves. Part I. Computations of the Reflection of Seismic Waves at Solid Boundaries. L. B. Slichter and G. V. Gabriel. Part II. Surface Motions due to Reflections in a Layered Crust. L. B. Slichter 1816, 1817
Elastic Systems Vibrating under Transient Impulse. M. Biot 1818
Apparent Velocity of Propagation of Superficial Earth Tremors. C. Alessandri 2292
Rediscussion of Some Near Earthquakes. H. Jeffreys 2293
Surface Waves in a Visco-Elastic Medium. T. Itoo 2741
Variation in the Rotation of the Earth and Volcanic Eruptions. H. Nagaoka 2889
Earthquake Stresses in Rigid Building Frames. W. Porush 2904
Earthquakes, Spatial and Temporal Distribution. S. Yamaguti 2905
Love Waves in Elliptic Coordinates. H. Arakawa 2906
Elastic Waves from a Point in an Isotropic Heterogeneous Sphere. R. Yosiyama 2907
Seismic Reflection Method of Prospecting. C. A. Heiland 3427
Volcanic Eruptions, Earthquakes and Pole-Shift. H. Nagaoka 3447
42-Minute Period in Frequency of After-Shocks. C. Davison 3448
Eleven-Year Period of Earthquake Frequency. C. Davison 3449
Nineteen-Year Period of Earthquake Frequency. C. Davison 3450
Travel Time of Earthquakes. Parts I and II. K. Wadati, K. Sagisaka and K. Masuda 3451
Stresses in Gravitating Solid with Spherical Inclusion. G. Nishimura and T. Takayama 4353
Stresses in Gravitating Solid with Cylindrical Inclusion. G. Nishimura and T. Takayama 4354
Effects of Discontinuity Surfaces on the Propagation of Elastic Waves. G. Nishimura and K. Kanai 4426
Amplitude of Rayleigh Waves on the Surface of a Stratified Medium. T. Suzuki 4427
Discontinuous Nature of Love Waves. J. Coulomb 4428
Propagation of Elastic Waves over the Plane Surface of a Semi-infinite Body. T. Sakai 4829
Propagation of Elastic Waves in a Heterogeneous Medium and the Validity of the Ray Theory. H. Arakawa 4830
Travel Time of Earthquake. Parts III and IV. K. Wadati and S. Oki 5236
See also 538, 539, 982, 1396, 4017, 4018, 4019 *under* 2 ; 3452 *under* 3.

2. Observational.

Seismic Scale and Maximum Acceleration. M. Ishimoto 158
P- and S-Curves Deduced from the Tango Earthquake, Japan, March 7, 1927. E. A. Hodgson 538
Two Probability Methods for Determining Earthquake Epicentres. E. A. Hodgson 539
Seismological Station at the Huancayo Magnetic Observatory, Peru. J. A. Fleming 981
Epicentral Time and Surface Structure Determined for the Tango Earthquake, Japan, March 7, 1927. E. A. Hodgson 982
Characteristics of a Deep Focus Earthquake. Study of the Disturbance of February 20, 1931. F. J. Scrase 1396
P- and S-Curves Derived from the Tango Earthquake. E. A. Hodgson 2294

Seismology, *continued.*

Abstract Nos.

Analysis of Rayleigh Waves. H. and (Mme) Y. Labrouste . . . 4017
Periodic Components in Love Waves. (Mme) Y. Labrouste . . . 4018
Earthquake Waves. Part IX. Sheltering Action of Earth's Core for Seismic Space Waves. H. Jung . . . 4019
Young's Modulus and Poisson's Ratio with Reference to Geophysical Applications. W. A. Zisman . . . 4418
Compressibility and Anisotropy of Rocks at and Near the Earth's Surface. W. A. Zisman . . . 4419
Comparison of Statically and Seismologically Determined Elastic Constants of Rocks. W. A. Zisman . . . 4420
Velocity of Elastic Waves in Granite and Norite. L. D. Leet . . . 4818
Smoothed Time-Distance Tables for a Normal Focus Earthquake. S. Gold and E. A. Hodgson . . . 5235
See also 2293, 2906, 3448, 3449, 3450, 3451, 5236 *under* 1; 3452 *under* 3.

3. Apparatus and Technique.

Damping of Seismographs. A. Proviero . . . 540
Improved Vibrograph and Applications. T. Tirunarayanachar . . . 873
Experimental Investigation of Lateral Earth Pressure during Earthquakes. N. Mononobe and H. Matsuo . . . 983
Interpretation of Seismic Time-Distance Curves. L. B. Slichter . . . 1397
New Vertical Seismograph. H. Benioff . . . 1398
Theory of the Oscillation Measurer. H. W. Koch and W. Zeller . . . 1716
Third-Order Aberrations of Seismograph Springs. L. F. Richardson . . . 2295
Tri-Dimensional Vibrograph. J. E. Shrader . . . 2884
Influence of Solid Friction on Dynamical Magnification of Seismographs. T. Hagiwara . . . 2908
Accuracy of Seismographical Measurements for Non-Stationary Processes. H. W. Koch and W. Zeller . . . 3452
Recording of Strong Seismic Motion. A. Blake . . . 4429
See also 3427 *under* 1.

Solution.

1. Theory.
2. Solubility.
3. Apparatus and Technique.
4. Unclassified.

Cross-References:
General Properties of Solutions, *see* Appropriate Key-Headings (*e.g.*, Viscosity, Conduction (Electric) in Solids and Liquids, etc.).

Cross-References (contd.):
Heats of Solution, *see* Thermochemistry, 1.
Surface Phenomena, *see* Adsorption, *also* Surface Tension and Cohesion.
Thermodynamical Effects, *see* Thermodynamics.

1. Theory.

Lyotropic Numbers and Properties of Ions. E. H. Büchner, A. Voet and E. M. Bruins . . . 17
Lyotropic Numbers and Viscosity. E. H. Büchner, E. M. Bruins and J. H. C. Merckel . . . 18
Heats of Dilution of Solutions of Strong Electrolytes, and the Association Hypothesis of Nernst. E. Plake . . . 656
Studies in Coordination. Part IV. Some Fluorides and Chlorides and their Complex Ions. F. J. Garrick . . . 659
Thermodynamic Properties of Liquid Solutions of Silver Bromide with Alkali Bromides. J. H. Hildebrand and E. J. Salstrom . . . 663
Theory of Concentrated Solutions. Part V. E. Wilke and W. Schränkler . . . 751
Classical Ionisation Theory. G. Tammann . . . 895
Theory of Rate of Solution of Gas in Liquid. S. Miyamoto . . . 896
Heats of Solution of Gases. J. Horiuti . . . 1349
Relation between Solubility and Diffusion of Gases in Liquids. J. Horiuti . . . 1350
Determination of the Mass of Electrolytic Ions. P. Debye . . . 1626
Diffusion of Electrolytes. R. J. Davies . . . 1702
Debye-Hückel Ion Size Parameter in Terms of Individual Ionic Radii. Activity Coefficient of Lead Chloride in Solutions of Cadmium Nitrate. H. D. Crockford and H. C. Thomas . . . 2036
Limiting Laws of the Interionic Attraction Theory of Strong Electrolytes. P. van Rysselberghe . . . 2591

Solution, *continued*.

Abstract Nos

Rate of Solution of Oxygen in Ethyl Alcohol Solutions of Stannous Chloride. S. Miyamoto and E. Utunomiya 2824
Cryoscopic Determination of Hydration of Ions in Solution. F. Bourion, E. Rouyer and (Miss) O. Hun 3198
Cryoscopic Determination of the Hydration of Ions of Potassium Chloride. F. Bourion and E. Rouyer 3199
Cryoscopic Determination of Hydration of Ions of Sodium Chloride. F. Bourion and (Miss) O. Hun 3200
Acid Strength and its Dependence on the Nature of the Solvent. W. F. K. Wynne-Jones 3201
Theory of the Rate of Solution of Solid into Liquid. S. Miyamoto 3950
Theory of Water and Ionic Solution, with Particular Reference to $\dot{H}$ and OH' Ions. J. D. Bernal and R. H. Fowler 3951
Cryoscopic Determination of Hydration of Ions of Ammonium Chloride. F. Bourion and E. Rouyer 4249
Chemical Potential of Salt Solutions. R. E. Gibson and L. H. Adams 4595
Theory of Concentrated Solutions of Strong Electrolytes. G. B. Bonino and G. Centola 5179

2. Solubility.

Solvent Influence on Solubility of Salts and Activity Coefficients of Ions. J. N. Brönsted, Agnes Delbanco and K. Volqvartz 109
Solvent Properties of Soap Solutions. Part III. System Sodium Oleate, Sodium Chloride, Water, Ethyl Acetate. E. L. Smith 110
Influence of Anions on the Velocity of Solution of Zinc. E. Müller and J. Förster 897
Influence of Pressure on the Solubility of Ammonium Nitrate in Water at 25°. L. H. Adams and R. E. Gibson 898
Solubility of Lithium in Liquid Ammonia. W. C. Johnson and M. M. Piskur .. 1351
X-Ray Investigations of, and Action of HNO_3 upon Au-Ag Alloys. M. le Blanc and W. Erler 1687
Solubility of Sodium Chloride in Liquid Ammonia. G. Patscheke 2237
Solubility of Oxygen in Gold and Gold-Silver Alloys. F. J. Toole and F. M. G. Johnson 2238
Solubility of Nitrogen in Water at 50°, 75° and 100° C. from 25 to 1000 Atmospheres. R. Wiebe, V. L. Gaddy and C. Heins, Jr. 2239
Solubility of Silver in Mercury. R. E. DeRight 2825
Solubilities, Conductivities, and Boiling-Point Elevations of Inorganic and Organic Compounds in Liquid Hydrogen Fluoride. K. Fredenhagen (with G. Cadenbach and W. Klatt) 3085
Cryoscopic Effects in Mixed Solvents and their Relation to the Solubility of Added Substances. O. Anders 3089
Solubility of Lime in Water and the Specific Conductivities of its Saturated Solutions. A. D. Grieve, G. W. Gurd and O. Maass 3769
Absorbent Properties and Specific Surface of Lead Sulphate. I. M. Kolthoff and C. Rosenblum 3875
Attraction of Insoluble Substances by Liquid Interfaces. H. Devaux 3954
Optical Properties, Densities, and Solubilities of the Normal Formates of some Metals of Group II of the Periodic System. F. W. Ashton, D. F. Houston and C. P. Saylor 4908
See also 1349, 1350, 2824 *under* 1; 1760, 2240 *under* 3.

3. Apparatus and Technique.

Method for Interpolating Data Based on Dühring's Rule. J. H. Perry and E. R. Smith 1739
Solubility of Inorganic Compounds in Liquid Ammonia. M. Linhard and M. Stephan 1760
Method for Examination of Binary Liquid Mixtures. W. A. Wright 1968
Solubility of Nitrogen in Liquid Ammonia at 25° C. from 25 to 1000 Atmospheres. R. Wiebe and T. H. Tremearne 2240
Photoelectric Instrument for Comparing the Strengths of Coloured Solutions. E. W. H. Selwyn 2938
See also 897, 2239 *under* 2.

4. Unclassified.

Determination of the Magnitude, Shape and Solvation of Macro-Molecules. G. V. Schulz 20

For the Key to this Index see pp. 1358 to 1372.

Solution, *continued.*

Abstract Nos.

Liquid Sodium Amalgams. G. R. Paranjpe and R. M. Joshi.................. 22
Alkali Metals and Salt Densities in Liquid Ammonia. W. C. Johnson and A. W. Meyer 43
Absorption Velocity of Gases by Liquids. Parts II and III. S. Hatta......... 1352
Melting Point Depressions of Borneol and Camphoroxime. T. S. Patterson, Janet H. Blackwood and J. McW. Stewart 1539
Voltage Effect with Strong and Weak Bases. J. Schiele...................... 1607
Adsorption and Solution Volume. Part II. Dependence of the Ionic State on Dilution. E. Ivanova and A. Rabinerson............................ 2665
Are Liquid Sodium Amalgams Colloidal ? H. E. Bent 2826
Solvation of Molecules and the Equation of State of the Adsorption Layer. S. E. Bresler, J. B. Chariton, B. A. and D. L. Talmud.................. 3877
Compressibility of Solutions. Part I. Apparent Molal Compressibility of Strong Electrolytes. F. T. Gucker, Jr. 4347

Spectroscopy.

1. Measurements of Wave-Length.
2. Line Spectra :
   (*a*) Line Emission in Infra-Red.
   (*b*) Line Emission in Visible and Ultra-Violet.
   (*c*) Line Absorption in Infra-Red.
   (*d*) Line Absorption in Visible and Ultra-Violet.
   (*e*) Analysis of Line Spectra.
   (*f*) Photometric Intensities and Contours of Lines.
   (*g*) Hyperfine Structure and Nuclear Moments.
   (*h*) Theoretical Papers on Line Spectra.
3. Band Spectra :
   (*a*) Emission Bands in Infra-Red.
   (*b*) Emission Bands in Visible and Ultra-Violet.
   (*c*) Absorption Bands in Infra-Red.
   (*d*) Absorption Bands in Visible and Ultra-Violet.
   (*e*) Analysis of Band Spectra.
   (*f*) Intensities in Band Spectra.
   (*g*) Theoretical Papers on Band Spectra.
4. Continuous Spectra :
   (*a*) Continuous Emission.
   (*b*) Continuous Absorption.
5. Fluorescence and Phosphorescence Spectra.
6. Zeeman Effect.
7. Stark Effect.
8. Raman Effect :
   (*a*) Gases and Vapours.
   (*b*) Liquids.
   (*c*) Solids.
9. Instruments and Apparatus.
10. Unclassified.

Cross-References :
Absorption, *see also* Absorption and Transmission (Radiation).
Critical Potentials, *see* Conduction (Electric) and Discharge in Gases, 5.
Fluorescence and Phosphorescence, *see also* Fluorescence, Phosphorescence, Luminescence and Afterglow.
Solar Spectrum, *see* Sun, 6.
Stellar Spectra, *see* Stars, 3.
X-Ray Spectra, *see* X-Rays, 6, 7 and 8.

1. Measurements of Wave-Length.

Determination of the Relationship between Wave-Lengths of Light and the Fundamental Standards of Length. J. E. Sears, Jr. and H. Barrell...... 79
OH Band λ 3064 and the Solar Spectrum. R. W. Shaw 149
Interferometric Measurements in the Spectrum of Krypton. C. V. Jackson.... 228
Wave-Lengths and Zeeman Effects in Lanthanum Spectra. W. F. Meggers.. 588
Interferometer Measurements in the Extreme Ultra-Violet Region of Copper. J. C. McLennan and (Miss) F. M. Quinlan....................... 589, 1482
Coloured Filter for Optical Pyrometers. L. Peychès.......................... 653
Wave-Lengths of H and K Lines of Calcium in Arc in Vacuo and their Red Shifts in Solar Spectrum. C. V. Jackson............................ 949
Band Spectra of MgO, CaO and SrO. P. C. Mahanti............................ 1033
Interferential Comparison of Radiations Emitted by a New Cadmium Lamp and the Michelson Lamp. J. E. Sears, Jr. and H. Barrell................... 1437
Interferometry. Part II. Construction Testing and Use of Reflection Échelons for the Visible and Ultra-Violet Regions. W. E. Williams.... 4466
Under-Water Spark Spectrum of Cerium. J. S. Badami......................... 4494
Wave-Lengths of the Vacuum Spark Spectra of Carbon, Nitrogen and Oxygen in the Extreme Ultra-Violet. B. Edlén................................ 4495
Wave-Length Comparator. G. Glockler and F.W. Fullerton 4914
Determination of Mean Effective Wave-Lengths and their Application in Heterochromatic Photometry. H. Buckley............................. 5289
See also 229, 1480, 3004 *under* 2 (*a*) ; 3005, 4088, 4916, 4917, 5306 *under* 2 (*b*) ; 599, 5314, 5315 *under* 2 (*e*) ; 4092 *under* 2 (*f*) ; 3566 *under* 3 (*a*) ; 3025 *under* 3 (*b*) ; 619 *under* 3 (*e*) ; 255 *under* 8 (*b*) ; 260, 293 *under* 9.

Spectroscopy, *continued.*

2. Line Spectra.

Abstract Nos.

(a) Line Emission in Infra-Red.

First Spark Spectrum of Antimony. R. J. Lang and E. H. Vestine 229
Spectra of H.F. Discharges. Part I. Comparison of Damped and Undamped Electrodeless Excitation. J. K. Robertson 590
First Spectrum of Xenon. C. J. Humphreys and W. F. Meggers 1480
Arc Spectrum of Sulphur. R. Frerichs 1481
Arc Spectrum of Iodine. S. C. Deb 1880
Infra-Red Spectra of Neon, Argon and Krypton. W. F. Meggers and C. J. Humphreys 3004
Arc Spectra of Chromium, Manganese, Cobalt, and Nickel in the Red and Near Infra-Red. H. Slevogt 3534
Infra-Red Arc Spectra of Manganese and Rhenium. W. F. Meggers 4087
See also 2403 *under* 2 (*b*); 3542, 4915 *under* 2 (*e*); 4513 *under* 2 (*h*); 252 *under* 7; 1067 *under* 8 (*a*).

(b) Line Emission in Visible and Ultra-Violet.

Recombination Spectrum of the Positive Column in Metal Vapours with Doublet Series. H. Krefft 230
Radiation from a Beam of Electrons in Mercury Vapour. L. R. Maxwell 231
Series in the Complex Spectrum of Singly Ionised HgII. T. S. Subbaraya 232
Cold Electric Arc in Vacuum. F. H. Newman 329
Spectroscopic Examination of Metal Electrodes in Vacuum Arcs. F. H. Newman 330
Visible Part of the Auroral Spectrum. L. Vegard 537, 2903
Excitation and Emission of Light in the Hydrogen Spark at High Pressures. W. Finkelnburg 591
Ultra-Violet Spark Spectrum of Rubidium. J. Janin 592
Schumann Lines of Copper, Silver and Gold. L. and E. Bloch and J. Farineau 593
Change of Wave-Length and Intensity of Iron, Nickel and Titanium Lines by Disruptive Discharge. H. Nagaoka, T. Futagami and I. Machida 594
Displacement of the PP-Combinations in the Sodium-Arc Spectrum and its Interpretation. H. Bartels 1034
Spectra Na IV, Mg V, Al VI and Mg III, Al IV in the Extreme Ultra-Violet. J. Söderqvist 1035
Pole Effect of Iron. Magdalena Adam 1036
Iron Spectrum in the Hydrogen Flame. Magdalena Adam 1037
Characteristics of the Metallic Spectra Excited by Active Nitrogen. H. Hamada 1038
Quantitative Spectrum analysis. Parts V, VI, VII and VIII. A. Iwamura 1483
Spectroscopic Applications of the Electrodeless Discharge. G. Déjardin 1484
H.F. Discharge in Helium and Mercury. E. Matuyama 1485
Extension of the First Spark Spectrum of Caesium (Cs II). J. Olthoff and R. A. Sawyer 1486
Measurement of the Intensity-Ratio of the Boron Isotopes B^{10} and B^{11}. L. S. Ornstein and J. A. Vreeswijk, Jr. 1487
Arc Spectrum of Radium Emanation. E. Rasmussen 2403
Spectrum of Rhenium. H. Schober 2404
Effect of Temperature on the Mercury Spectrum. O. Masaki 2405
Intensity Relations of the D-Lines in a Sodium-Gas Discharge. W. de Groot 2406
Distribution of Emission in Arcs. K. Bruckersteinkuhl 2407
Spectra of the Ca I-Like Ions: Mn VI, Fe VII, Co VIII and Ni IX. W. M. Cady 2408
Extension of the Pd I-Like Isoelectronic Sequence to Antimony VI and Tellurium VII. G. K. Schoepfle 3005
Multiplets in the Spectra of Cb III and Mo IV. A. Y. Eliason 3006
First Spark Spectrum of Arsenic. A. S. Rao 3535
Spectrum of Molybdic Anhydride. G. Piccardi 3536
H.F. Spectrum of Argon in Presence of Mercury. R. Zouckermann 3537
H.F. Spectra Emitted by H.F. and D.C. Discharges in Helium. J. E. Keyston 3538
Emission of Light from a Gaseous Mixture. W. Uyterhoeven, J. Bruynes and C. Verburg 3539
Light Emission from Discharge Tubes. H. Krefft, M. Reger and R. Rompe 3540
Spark Spectrum of BaII. E. Rasmussen 3541
Absence of Fine Structure in the Arc Spectrum of Silver. S. Tolansky 3549

Spectroscopy, *continued.*

Abstract Nos.

Spark Spectrum of Copper between 400 and 240 Å. L. and E. Bloch 4088
Multiplets in the Spectra of O III, O IV, O V and C III. P. G. Kruger and W. E. Shoupp 4089
Spectrum of the A^{++} Ion, AIII. V. v. Keussler 4090
Excitation of Balmer Lines. F. Zimmer 4496
Attempts to Extend the Helium Spectrum by Excitation of Both Electrons. A. H. Rosenthal 4497
Arc Spectrum of Mercury. H. Beutler 4498
Arc Spectrum of Neodymium. S. P. de Rubies 4499
Electromagnetic Fields due to Variable Electric Charges and the Intensities of Spectrum Lines according to the Quantum Theory. V. Fock 4678
Second Spectrum of Krypton. T. L. de Bruin, C. J. Humphreys and W. F. Meggers 4916
Spectrum of Doubly Ionised Neon in the Extreme Ultra-Violet. V. v. Keussler 4917
Radiation of Metal Surfaces Bombarded by Positive Alkali Ions. H. Mayer 5292
Spark Spectrum of Ion in Extreme Ultra-Violet. L. and E. Bloch 5306
See also 228, 589, 590, 1482, 4494, 4495 *under* 1; 229, 1480, 1481, 1880, 3534 *under* 2 (*a*); 1489 *under* 2 (*d*); 3542, 4502, 4915, 5310, 5316 *under* 2 (*e*); 4503 *under* 2 (*f*); 1986, 1987 *under* 3 (*b*); 3592 *under* 5; 252 *under* 7; 215, 2450, 4952 *under* 9.

(*c*) *Line Absorption in Infra-Red.*

Absorption of Radiation Originating from a Beam of Electrons in Helium. L. R. Maxwell 595
Infra-Red Absorption Spectra of Halogen Derivatives of Methane. J. Lecomte 3007
Elimination of Errors due to Absorption in the Prism, and Other Causes, in Infra-Red Absorption Measurements. D. G. Drummond 5307
See also 1880 *under* 2 (*a*); 596, 4091, 5308 *under* 2 (*d*); 3547 *under* 2 (*e*).

(*d*) *Line Absorption in Visible and Ultra-Violet.*

Absorption Spectra of the Samarium Ion in Solids. Parts I, II and III. F. H. Spedding and R. S. Bear 233, 234, 4501
Absorption Spectrum of Nitrous Oxide and Heat of Dissociation of Nitrogen. A. K. Dutta 301
Line Spectrum of the Samarium Ion in Crystals and its Variation with Temperature. S. Freed and J. G. Harwell 596, 1488
Influence of Temperature on Absorption in the Far Ultra-Violet for Aqueous Solutions of Hydrogen Chloride. R. Trehin 1039
Reversal Measurements on Spectral Lines and the Determination of the Total Absorption and the Relative Populations of Excited Atomic States. H. Kohn 1489
Absorption Spectra of Complex Chromium Salts. G. Joos and K. Schnetzler 1882
Absorption of the 1s–3d Lines by Potassium. T. Okuda 3008
Rôle of the Absorption of the Exciting Ray in the Spectra of Resonance. W. Kessel 3009
Excitation of Atom Lines by Molecular Absorption in Cd Vapour. E. Kalinowska 3010
Distribution of Vibration Levels in Iodine Vapour. L. Natanson 3011
Pressure Effects of Foreign Gases on the Sodium *D*-Lines. H. Margenau and W. W. Watson 4091
Width of Absorption Lines of I_2. I. I. Agarbiceanu 4500
Absorption in the Far Ultra-Violet of Aqueous Solutions of Hydrochloric Acid. R. Tréhin 4918
Pressure Effects of Nitrogen on Potassium Absorption Lines. W. W. Watson and H. Margenau 5308
See also 949 *under* 1; 1880 *under* 2 (*a*); 595 *under* 2 (*c*); 4923 *under* 2 (*f*); 3560 *under* 2 (*h*); 3577, 3578 *under* 3 (*d*); 3592 *under* 5.

(*e*) *Analysis of Line Spectra.*

Classification of the Spectral Lines of Cl V and Cl IV. S. C. Deb 597
Excitation by Collision with Electrons, Ions and Atoms. W. Hanlé and K. Larché 598
Analysis of Lanthanum Spectra LaI, LaII and LaIII. H. N. Russell and W. F. Meggers 599
First Spark Spectrum of Tellurium. S. C. Deb and H. B. Mohanti 600

For the **Key** to this Index see pp. 1358 to 1372.

Spectroscopy, *continued*.

Abstract Nos.

Lifetime of the Metastable $^3P_2$ Neon Atom. E. Matuyama 605
Duration of Metastable States of Neon. J. M. Anderson 606
Excitation Functions of Atomic Hydrogen. L. S. Ornstein and H. Lindeman 1889
Investigation of Natural Gases for Helium Content. E. v. Angerer and H. Funk 2409
Spectrum of Selenium. Part II. J. S. Badami and K. R. Rao 3542
Alkali Metals in Minerals. R. Bossuet 3543
Absolute Value of the Terms of As. W. M. Hicks 3544
Significance of Colours Produced by Atoms. A. D. Fokker 3545
Fine Structure of Reststrahlen. M. Born and M. Blackman 3547
Fine Structure of the Metastable Nitrogen Line 1492·83. W. Tschulanovsky 3548
Forbidden Lines in Astrophysical Sources. J. C. Boyce, D. H. Menzel and Cecilia H. Payne 3976
Atomic Chlorine. G. M. Schwab and H. Friess 4205
Tables of Atomic Spectral Terms of Carbon, Nitrogen and Oxygen. B. Edlén 4502
Preliminary List of Terms for the Arc Spectrum of Tantalum. C. C. and Harriet K. Kiess 4915
First Spark Spectrum of Gold (Au II). B. V. R. Rao 4919
Perturbations in the Ba I Spectrum. G. O. Langstroth 4920
Resonance Lines of Silver. A. Filippov and I. Islamov 5309
Arc Spectrum of Cerium. P. Karlson 5310
Regularities in the Spectrum of Doubly Ionised Cerium. P. N. Kalia 5311
Spectra of Potassium in Successive Stages of Ionisation. M. Ram 5312
Spectra of Trebly and Quadruply Ionised Calcium. M. Ram 5313
Arc Spectrum of Sulphur. K. W. Meissner, O. Bartelt and L. Eckstein 5314
Spark Spectrum of Sulphur, SII. O. Bartelt and L. Eckstein 5315
Arc Spectrum of Sulphur in the Ultra-Violet. J. E. Ruedy 5316
See also 1480, 1481, 3004 *under* 2 (*a*); 231, 232, 1034, 1035, 1486, 2408, 3006, 3535, 3549, 4089, 4090, 4916, 4917 *under* 2 (*b*); 74, 5319 *under* 2 (*f*); 2412, 3017 *under* 2 (*g*); 242 *under* 3 (*c*); 2423 *under* 3 (*d*); 4537 *under* 7; 259, 293 *under* 9.

(*f*) *Photometric Intensities and Contours of Lines.*

Optical Investigation of the Collision of Gas Atoms with a Wall of the Enclosure. L. S. Ornstein and W. R. van Wijk 74
Intensities of Spectral Lines of He, Hg and N_2 Excited by Electron Bombardment. O. Thieme 235
True and Apparent Distribution of Intensity in Spectral Lines. H. C. Burger and P. H. van Cittert 1040, 2411
Optical Investigations of Discharges with Condensed Sparks in Rarefied Gases. N. Ryde 1155
Energy Distribution in the Mercury-Arc Spectrum. L. B. Johnson and L. Burns 1888
Photographic Action of Lines in the Flame Spectra of the Alkali Metals. R. Bossuet 1890
Effect of Foreign Gases on the Relative Intensities of the Hg Triplet $2^3P_{012} - 2^3S_1$ under conditions of Optial Excitation. R. T. Macdonald and G. K. Rollefson 2410
Theory of the Breadth of Special Lines Using Correspondence Principle Methods. H. Casimir 3012
Peculiar Structure of the Hydrogen Resonance Lines 1216 Å. M. Kulp and H. E. Binkele 3013
Intensity Measurements of the Principal Series Terms of Rubidium and Cæsium. H. Kohn and H. J. Hübner 3550
Light Yield Measurements in the Sodium Spectrum by Excitation by Means of Electron Bombardment. G. Haft 3551
Intensity of Spectral Lines in the Glow Discharge of the So-called Multi-Coloured (Bunt) Hydrogen. A. Güntherschulze and H. Betz 3552
Relation between the Intensities of Balmer and Paschen Lines. L. S. Ornstein and H. C. Burger 3553
Temperature Classification of the Spectrum of Neodymium. A. S. King 4092
Intensity Measurements of Lines in the Principal Series of Rubidium and Cæsium. H. J. Hübner 4503

Spectroscopy, *continued.*

Abstract Nos.

Intensity Distribution and Breadth of the Predissociation Lines of the Al-H Molecule. L. Farkas and S. Levy 4504
Abnormal Increase in Intensity of the Mercury Lines 5461, 4358 and 4047 Å due to Very Dry Hydrogen and Other Gases. A. Güntherschulze and H. Betz 4505
Perturbations in the Ba I Spectrum. G. O. Langstroth 4920
Intensity Relations in the Cadmium Spectrum. J. L. Verhaeghe 4921
Intensities of Spectra Emitted by H.F. Discharges in Helium. J. E. Keyston 4922
Fine Structure and Natural Width of Self-Reversed Spectral Lines. E. Lau, O. Reichenheim and J. Johannesson 4923
Intensity and Structure of Spectral Lines. V. F. I. Weisskopf 5317
Intensities in Atomic Spectra. M. H. Johnson, Jr. 5318
Relative Intensity Tables for Spectrum Lines. H. E. White and A. Y. Eliason 5319
Positive Ion Excitation of Mercury Vapour. E. J. Jones 5403
Doppler Effect in Spectra of Positive Rays of Uniform Velocity in A, Ne and He. Anna I. McPherson 5405
See also 4916 *under* 2 (*b*); 4091, 5308 *under* 2 (*d*); 3543 *under* 2 (*e*); 3020, 4095, 4096 *under* 2 (*h*); 4537 *under* 7; 2451 *under* 9.

(*g*) *Hyperfine Structure and Nuclear Moments.*

Nuclear Spin and Magnetic Moment of Li. L. P. Granath 236
Intensities of the Hyperfine Structure Components of the Most Intense Lines of the Visible Spectrum of HgI. Hyperfine Structure of the Term $(Hg^{199})7^3D_2$. J. Gilles 237
Collision Phenomena in the Optical Excitation of the Various Mercury Isotopes. S. Mrozowski 238
Illumination Period of Mercury Resonance Line 2537 Å. S. Mrozowski 239
Hyperfine Structure of the Arc Lines and the Nuclear Moment of Copper. R. Ritschl 601
Hyperfine Structures in the Antimony Spark Spectrum and the Nuclear Moments of Antimony Isotopes. J. S. Badami 602
Hyperfine Structures in the Antimony Arc Spectrum SbI. J. S. Badami 603
Isotope Displacement in Hyperfine Structure. G. Breit 604
Fine Structure of Arc Lines of Tin and Lead. S. B. L. Mathur 1041
Hyperfine Structure of Arc Lines in Vacuum of Bismuth in the Visible and Ultra-Violet Regions. W. Mohammad and P. N. Sharma 1042, 1043
Hyperfine Structure of the Spectra of Sodium, Mercury and Lead. Origin of the Intensity Variation of Hyperfine Structure Components. K. Murakawa 1044
Hyperfine Structure and Atomic Nuclei. H. Kallmann and H. Schüler 1045
Nuclear Moment of Indium. D. A. Jackson 1490
Magnetic Moments of K and Li with Regard to Their Nuclear Magnetic Moments. W. Meissner and H. Scheffers 1642
Line Groups and Fine Structure. F. Paschen 2412
Nuclear Moments of Tellurium and Selenium Isotopes. S. Rafalowski 2413
Hyperfine Structure of the Lines of the Arc Spectrum of Rubidium. D. A. Jackson 2414
Isotope Displacement and Nuclear Moments of Zinc. H. Schüler and H. Westmeyer 3014
Nuclear Magnetic Moments. S. Goudsmit 3015
Paschen-Back Effect of Hyperfine Structure and Polarisation of Cadmium $(6^1P_1-5^1S_0)$ Resonance Radiation. N. P. Heydenburg 3016
Spectra of PbII, Hg I, Sb I, Cl II and I II. K. Murakawa 3017
"Prohibited" Rays Due to Nuclear Spin. R. Einaudi 3018
Isotope Displacement Effect. H. Schüler and H. Westmeyer 3554
Hyperfine Structure. H. Schüler and H. Westmeyer 3555
Theory of Hyperfine Structure. E. Fermi and E. Segrè 3556
Hyperfine Structure and the Polarisation of Resonance Radiation. Part II. Magnetic Depolarisation and the Determination of Mean Lives. A. C. G. Mitchell 3557
Anomalies in Hyperfine Structure. S. Goudsmit and R. F. Bacher 3558
Hyperfine Structure of Perturbed Series. E. G. Jones 3559
Magnetic Moment of the Nitrogen Nucleus. R. F. Bacher 3834
Hyperfine Structure and Nuclear Moments of Rubidium. H. Kopfermann 4093
Nuclear Moments and their Dependence Upon Atomic Number and Mass Number. N. S. Grace 4506
Nuclear Spin of Arsenic. A. S. Rao 4507

Spectroscopy, ***continued.***

Abstract Nos.
Hyperfine Structure in the Arc Spectrum of Fluorine. J. S. Campbell 4508
Magnetic Transformation of the Hyperfine Structure in Mercury. D. R. Inglis 4509
Hyperfine Structure in the Spark Spectrum of Cadmium. E. G. Jones........ 4510
Neutrons and Nuclear Magnetic Moments. B. Venkatesachar and T. S. Subbaraya 4856
Hyperfine Structure and Nuclear Moments of Krypton. H. Kopfermann and N. Wieth-Knudsen 4924
Hyperfine Structure in Intermediate Coupling. G. Breit and L. A. Wills........ 4925
Nuclear Spin of Li^7 from Hyperfine Structure Data. N. M. Gray 4926
Hyperfine Structure Intensities of the $2^3S_1-2^3P_{0,1,2}$ Triplet in Optically Excited Mercury Vapour. M. L. Pool and S. J. Simmons 5320
See also 1437 *under* 1; 4087 *under* 2 (*a*); 4923, 5319 *under* 2 (*f*); 4096 *under* 2 (*h*); 4880 *under* 9.

(*h*) *Theoretical Papers on Line Spectra.*
Analytic Atomic Wave Functions. J. C. Slater 90
Atomic Eigenfunctions and Energies. C. W. Ufford and G. H. Shortley........ 91
Dispersion and Absorption of Helium. J. P. Vinti 1046
Calculation of the Terms of the Optical Spectrum of an Atom with One Series Electron. J. McDougall 1047
Widening and Shift of Spectral Lines with Pressure. M. Kulp 1048
Interaction between Atoms with *s*-Electrons. N. Rosen and S. Ikehara 1341
Multiplet Separation in the Spectra of Atoms with Two Outer Electrons. H. C. Brinkman 1491
Width of Spectral Lines in Gases. V. Weisskopf 1492
Wigner's Extension of the Thomas-Kuhn Summation Law for an Electron in a Central Field. H. A. Kramers, C. C. Jonker and T. Koopmans........ 1493
Electromagnetic Fields due to Variable Electric Charges and the Intensities of Spectrum Lines according to the Quantum Theory. G. A. Schott........ 1645
Theory of Electron Spin. S. Shimasaki........ 1747
Perturbed Series in the Spectrum of Ionised Aluminium. L. Pincherle........ 1891
General Theory of the Broadening of Spectral Lines. W. Lenz 1892
Some Integrals of Importance in the Theory of the Pressure Broadening of Spectral Lines. H. Jensen 1893
Pressure Broadening of Spectral Lines. Part II. H. Margenau 1894
Interaction of Configuration: $sd-p^2$. R. F. Bacher........ 1895
Theoretical Investigation of the Oxygen Atom in Various States of Ionisation. D. R. Hartree and (Miss) M. M. Black 1896
Quantum Mechanics of Seven and Eight Electrons with Spin Degeneracy. H. Eyring and G. E. Kimball 2220
Variable Scale Atomic Wave Functions. J. P. Vinti and P. M. Morse........ 2221
Atomic Wave-Functions Expressed in Terms of Momenta. W. Elsasser........ 2222
Transformation in the Theory of Complex Spectra. G. H. Shortley 2415
Wave Functions for the Ground State of Lithium and Three-Electron Ions. E. B. Wilson, Jr. 2416
Almost Closed Shells. M. H. Johnson, Jr. 2792
Quantum Theory of Inelastic Electron Collisions. L. Goldstein........ 3019
Intensity Distribution in Spectral Lines Excited by Electron Impact. W. Heitler 3020
Probability of Excitation of Helium 2^1P at Zero Angle. J. E. Taylor and R. Whiddington 3021
Lifetimes of Unstable Molecules. N. Rosen 3022
Polarisabilities of Ions from Spectra. J. E. and Maria G. Mayer 3176
Electron Spin and Theory of the Neutron. W. Wessel 3474
Dispersion of Light in the Neighbourhood of Quadripole Lines. J. Blaton........ 3560
Dissociation of Excited Diatomic Molecules by External Perturbations. C. Zener 3561
Oscillation Structure of Electron-Transfer in Polyatomic Molecules. G. Herzberg and E. Teller 3562
Applicability of the Franck-Condon Rule to Line Broadening. W. Lenz........ 3563
Primed (Two-Electron) Terms of the Alkali-Earth Spectra. H. C. Brinkman 3564
Activation Energies for Reactions of Atoms in Different States. G. K. Rollefson and J. C. Potts 3693
Magnetic Interaction of a Valence Electron with Inner Shells. M. H. Johnson, Jr., and G. Breit 3934
Deepest Excited Terms of Neon by Slater's Method. S. Rozental........ 4094

For the **Key** to this Index see pp. 1358 to 1372.

Spectroscopy, ***continued.***

Abstract Nos.

Quantitative Determination of the Excitation Functions of some Terms of the Mercury Atom. R. Seiler ... 4095
Line Spectra of Atoms. Part I. G. Joss ... 4096
Duration of Existence of Excited Atomic States. V. Weisskopf ... 4511
Wave-Mechanical Calculation of Rydberg Correction of Helium Terms. E. A. Hylleraas ... 4512
Oscillations Structure in the Spectrum of Carbon Tetrachloride. J. Horiuti ... 4513
Charge Distribution for the Normal Atoms from Boron to Neon. F. W. Brown, J. H. Bartlett, Jr., and C. G. Dunn ... 4514
Theoretical Optics of the Hydrogen Molecule. B. Mrowka ... 4927
Dissociation of Diatomic Molecules with *p-p*-Bindings. H. Lessheim and R. Samuel ... 4928
Isotope Shift in Neon. J. H. Bartlett, Jr., and J. J. Gibbons, Jr. ... 4929
Multiplet Separations and Perturbed Terms. N. G. Whitelaw ... 4930
Quantum Defect of Non-Penetrating Orbits, with Special Application to Al II. J. H. van Vleck and N. G. Whitelaw ... 4931
Inversion of Doublets in Alkali-Like Spectra. Melba Phillips ... 5321
Characteristic Values of the Two Minima Problem and Quantum Defects of *f* States of Heavy Atoms. Ta-You Wu ... 5322
Configuration Interaction in Complex Spectra. C. W. Ufford ... 5323
Relative Multiplet Transition Probabilities from Spectroscopic Stability. E. U. Condon and C. W. Ufford ... 5324
Energy Levels of the Rare-Gas Configurations. G. H. Shortley ... 5325
Energy Levels of the Hydrogen Molecular Ion. C. Gilbert ... 5326
See also 3545, 3547 *under* 2 (*e*) ; 5317, 5318 *under* 2 (*f*) ; 2412, 3018 *under* 2 (*g*) ; 2436, 2437 *under* 4 (*a*).

3. Band Spectra.

(*a*) *Emission Bands in Infra-Red.*

Band System of CaO in the Near Infra-Red. P. H. Brodersen ... 1049
Barium Hydride Band Spectra in the Near Infra-Red. W. W. Watson ... 1494
Vibration Spectra and Molecular Structure of Methyl and Ethyl Alcohols. R. Titéica ... 1897
Infra-Red Spectrum of Carbon Dioxide. A. Adel and D. M. Dennison ... 3027, 4102
Relation between Emission and Absorption Spectra of Salts of Rare Earths in the Solid State. Part I. Phosphor Activated by Rare Earths. R. Tomaschek and O. Deutschbein ... 3496
Fluorescence of Pure Salts of Rare Earths. R. Tomaschek and O. Deutschbein 3497
Near Infra-Red Band System of Strontium Oxide. K. Mahla ... 3565
Long-Wave Arc Spectra of Alkalies and Alkaline Earths. W. F. Meggers ... 3566
Spectrum of Carbon Dioxide. G. P. Ittmann ... 3568
See also 588, 1033 *under* 1 ; 590 *under* 2 (*a*) ; 5330 *under* 3 (*c*) ; 4527 *under* 3 (*e*) ; 1088, 3567 *under* 9.

(*b*) *Emission Bands in Visible and Ultra-Violet.*

Near Ultra-Violet Bands of Silicon Tetrachloride. A. C. Datta ... 240
Spectrum of Potassium Hydride. G. M. Almy and C. D. Hause ... 241
Colours of Inorganic Salts. M. N. Saha and S. C. Deb ... 560
Band Spectrum of Chromium Oxide. C. Ghosh ... 607
Photometric Investigation of the Strongest Emission Band of Fluorine. J. Aars 609
Interpretation of the Rotational Structure of the CO$_2$ Emission Bands. R. S. Mulliken ... 623
Band Spectrum, Predissociation and Structure of the P$_2$ Molecule. G. Herzberg 1050
Spectra Emitted during the Early Stages of a Condensed Discharge through Nitrogen at Low Pressure. H. Hamada ... 1051
Auroral Spectrum. J. Kaplan ... 1393
Spectrum of the Corona Discharge in Air, Oxygen and Nitrogen. A. C. Young and A. G. Creelman ... 1495
Origin of the Mercury Bands at 2480 Å. J. G. Winans ... 1496
Diffuse Band Accompanying the D-Lines. K. Wurm ... 1497
Chappuis Ozone Bands and the Boric Acid Spectrum. E. Walles ... 1498
Band Spectrum of CO$^+$. D. Coster, H. H. Brons and H. Bulthuis ... 1499
Activation of Air by the Electrodeless Ring Discharge. B. Arakatsu and K. Kimura ... 1986
Electrodeless Ring Discharge through Potassium Vapour. B. Arakatsu and Y. Uemura ... 1987

For the Key to this Index see pp. 1358 to 1372.

Spectroscopy, *continued*.

Abstract Nos.

Effects of Pressure on the Visible Band Spectra of Nitrogen. H. S. Harned and E. R. Brownscombe 2417
Band Spectrum of Potassium Hydride. T. Hori 3023
Mercury Bands Associated with the 2482·07 Å Line. L. Job 3024
Spectrum of Hydrogen Sulphide. N. O. Stein 3025
Rotation-Vibration Spectrum of Ethylene in the Near Ultra-Violet. W. Scheib and P. Lueg 3569
Fine Structure of the Ultra-Violet Bands of Carbon Disulphide. A. Jonescu .. 3570
Spectrum of OH Molecule: New (2,2) Band; Satellite Series in $\lambda 3122$; Λ-Type Doubling and Electronic Spin Doubling. D. H. Dawson and H. L. Johnston 3571
Absorption of Excited Mercury Vapour. O. Masaki 3579
Interpretation of the Mercury-Argon Bands at 2365 and 2285 Å and of the Hg_2 Band at 1690 Å. W. Finkelnburg 3586
Band Spectra Superimposed on the Continuous Spectra of Mercury in the Visible Region. J. Okubo and E. Matuyama 4097
$\lambda 2875$ Band of Neutral OH. T. Tanaka and M. Siraisi 4098
New Bands in the Spectrum of Vanadium Monoxide. G. Piccardi 4099
Absorption Bands of Coloured Alkali Halides. J. H. de Boer and W. de Groot 4100
Structure and Zeeman Effect of the Doublet CO_2 Emission Bands at 2900 Å. R. Schmid 4101
Band Spectrum of Copper Hydride. A. and T. Heimer 4515
Second Positive Group in the Nitrogen Spectrum. D. Coster, F. Brons and A. van der Ziel 4516
Emission Spectrum of Molecular Hydrogen in the Extreme Ultra-Violet. C. R. Jeppesen 4517
Band Spectrum of Barium Hydride. G. Funke 4518
Double Band at 3660 Å in the Spectrum of Carbon Dioxide. R. Schmid 4519
Spectra of Halogen Molecules. Part I. Iodine. W. E. Curtis and S. F. Evans 4932
Band Spectrum of Tin Oxide. F. C. Connelly 4933
Reactions of the Hydroxyl Radical in the Electrodeless Discharge in Water Vapour. W. H. Rodebush and M. H. Wahl 5014
Spectrum of the Afterglow of Carbon Dioxide. A. Fowler and A. G. Gaydon .. 5275
Band Emission of Carbon Dioxide. R. Schmid 5327
Spectrum of Sulphur Dioxide. Tung-Ching Chow 5328
New O_2^+ Bands. Dissociation Energy of O_2^+ and Ionisation Potential of O_2. R. S. Mulliken and D. S. Stevens 5329
See also 537, 2405, 2903, 3536, 3538 *under* 2 (*b*); 1049, 3496, 3497, 3566 *under* 3 (*a*); 246, 3584, 4526, 4527 *under* 3 (*e*); 2432 *under* 3 (*f*); 5339 *under* 3 (*g*); 2435 *under* 4 (*a*); 4948 *under* 6.

(*c*) *Absorption Bands in Infra-Red.*

Far Infra-Red Spectra of Gases. J. Strong and S. C. Woo 242
Infra-Red Spectrum of H^2Cl. J. D. Hardy, E. F. Barker and D. M. Dennison 243
Absorption of Iodine Fluorescence in Iodine Vapour. I. I. Agarbiceanu 566
Rotational-Vibrational Spectrum of Water Vapour. R. Mecke and W. Baumann 610
Infra-Red Absorption of Carbon Tetrachloride. C. Schaefer and R. Kern.... 611
Infra-Red and Raman Bands of Carbon Dioxide, Carbon Oxysulphide and Carbon Disulphide. A. B. D. Cassie and C. R. Bailey 612
Oscillation and Rotation of the Ammonia Molecule. E. Fermi 620
Infra-Red Absorption Spectra of Hydrocarbons. P. Lambert and J. Lecomte 1052
Infra-Red OH Band of Phenol. M. Naherniac 1053
Infra-Red Absorption Spectrum and Molecular Spectrum of Ozone. S. L. Gerhard 1054
Absorption Measurements and Transition Probabilities for the A (0,0) and B (0,1) Bands of Oxygen. W. H. J. Childs 1055
Infra-Red Absorption Spectra of Ammonium Salts in the Region of their Anomalous Specific Heats. R. Pohlman 1056
Infra-Red Absorption Spectrum of Hydrogen Cyanide. K. N. Choi and E. F. Barker 1500
Chemical Aspects of the Infra-Red Absorption Spectra of the Ethyl Halides. P. C. Cross and F. Daniels 1501
Infra-Red Absorption Bands of Ammonia. H. J. Unger 1502
Changes Produced by a Dissolved Substance on the Infra-Red Absorption Spectrum of a Solvent. Part I. Influence of Dissolved Salts on the State of Association of Solvent Water. R. Suhrmann and F. Breyer 1883

Spectroscopy, ***continued.***

Abstract Nos.
Envelopes of Infra-Red Absorption Bands. S. L. Gerhard and D. M. Dennison 1884
Infra-Red Absorption Spectra of Organic Compounds and Constituents of Motor Spirits. C. F. Kettering and W. W. Sleator 1898
Fundamental Frequencies of the SiO_4 Group. J. Weiler 1912
Dielectric Constant of Liquid Sulphur. H. J. Curtis 2024
Selection Rules for the Vibration Spectrum of Calcite. F. Matossi 2418
Infra-Red Absorption Bands of Methane. W. V. Norris and H. J. Unger 2419
Band Spectrum of Water-Vapour. Parts I, II and III. R. Mecke, W. Baumann and K. Freudenberg 2420
Equivalent Widths in the A and B Bands of Oxygen. W. H. J. Childs 2421
Infra-Red Absorption Spectra of Certain Alkaloids. M. E. O'Byrne 3026
Molecular Vibrations of Three-Particle Systems with Special Applications to the Ethyl Halides and Ethyl Alcohol. P. C. Cross and J. H. van Vleck 3286
Calculation of the Vibration Frequencies and Other Constants of the H_2O Molecule. J. H. van Vleck and P. C. Cross 3287
Infra-Red Absorption Measurements on Organic Substances. Part I. Apparatus and the Absorption Spectra of Solvents and Organic Dyes. G. Buss. Part II. Absorption of Certain Organic Liquids below $2 \cdot 7\mu$. O. Eichmann 3572, 3573
Infra-Red Absorption Bands of Acetylene. G. B. B. M. Sutherland 3574
Infra-Red Absorption of Benzene in the Liquid, Solid and Vapour States. C. E. Leberknight 3575
Infra-Red Absorption Spectra of NO_2 and N_2O_4. R. Schaffert 3576
Infra-Red Absorption Spectrum of Nitrogen Tetroxide. G. B. B. M. Sutherland 4104
Rotational Spectrum of Water Vapour. J. Künhne 4520
Far Infra-Red Absorption Spectra of Ammonia and Phosphine Gases under High Resolving Power. N. Wright and H. M. Randall 4521
Transmission of Infra-Red Radiation through the Horny Layer of Human Skin. A. R. Pearson and R. E. Norris 4689
Absorption of Amines in the Near Infra-Red. U. Liddel and O. R. Wulf 4934
Investigation in the Infra-Red Region of the Spectrum. Part IX. Absorption Spectrum of Chlorine Monoxide (Cl_2O). C. R. Bailey and A. B. D. Cassie 4935
Infra-Red Absorption of Benzene Vapour. R. Titeica 5330
Infra-Red Absorption Spectra of Benzene Derivatives. R. Freymann and A. Naherniac 5331
Near Infra-Red Absorption Bands. R. Freymann 5332
Character of Bonds in Hydrogen Halides as Found by Absolute Intensity Measurements of the Infra-Red Primary Bands. E. Bartholomé 5333
Infra-Red Spectrum of Propane and Diacetylene. E. Bartholomé 5334
Spectral Differentiation of Pure Hydrocarbons: Near Infra-Red Absorption Study. U. Liddel and C. Kasper 5335
Infra-Red Absorption Spectra of Plant Pigments. R. Stair and W. Coblentz 5336
See also 5307 *under* 2 (*c*); 3027, 3565, 4102 *under* 3 (*a*); 622 *under* 3 (*e*); 625 *under* 3 (*f*).

(*d*) *Absorption Bands in Visible and Ultra-Violet.*
Modified Ionic States in Crystals. C. P. Snow and F. I. G. Rawlins 39
Absorption Spectrum of Nitric Oxide. A. Herrmann 244
Spectrum of Adsorbed Iodine. D. Chilton and E. Rabinowitsch 245
Absorption Spectrum of Highly Compressed Oxygen. W. Finkelnburg and W. Steiner 608
Molecular Absorption by Mixed Halogen Molecules in Vacuum-Ultra-Violet. Part II. H. Cordes and H. Sponer 613
Absorption Spectrum of Sulphur Dioxide. A. K. Dutta 614
Absorption Spectrum of Calcium Chloride Vapour. S. C. Deb and B. Mukerjee 615
Ultra-Violet Absorption Spectrum of Azoxybenzol. E. Müller and E. Hory 616
Absorption Spectrum and Dissociation Constants of Arsenic Acid. P. Goldfinger and H. D. G. v. Schweinitz 617
Colour and Structure of Oximes and Semi-Carbazones. (Mme.) Ramart-Lucas and (Mme.) M. Grumez 618
Ultra-Violet Absorption of Halogen Derivatives of Methane. A. Henrici 1057
Absorption of Ultra-Violet Radiation by Methane, Ethane and Normal Butane in the Gaseous State. W. Kemula and S. Mrazek 1058

For the **Key** to this Index see pp. 1358 to 1372.

Spectroscopy, *continued.*

Abstract Nos.

Ultra-Violet Absorption Spectra of Phosphine, Arsine and Stibine. G. H. Cheesman and H. J. Emeléus ... 1059
New Absorption Bands of Methane in the Ultra-Violet. R. Mecke ... 1503
Absorption Spectra of Complex Salts of Cr, Mn, Ru, Rh, Pd, Re, Os, Ir, and Pt. R. Samuel and A. R. R. Despande ... 1504
Primary Photochemical Processes. Part II. Absorption Spectrum and Photochemical Decomposition of Diazomethane. W. Kirkbride and R. G. W. Norrish ... 1854
Colour of Sulphuric Acid Solutions of Di- and Triphenylmethanes. L. C. Anderson ... 1885
Spectrum of the Discharge through Oxygen and Hydrogen Mixtures. A. S. Roy ... 1886
Absorption Spectra of Higher Oxides. A. K. Dutta and P. K. Sen Gupta ... 1887
Effect of Crystal Symmetry and Chemical Composition on the Energy Levels of Solids. F. H. Spedding and G. C. Nutting ... 1899
Ultra-Violet Absorption Spectra of Simple Benzene Derivatives. F. W. Klingstedt ... 1900
Absorption of Metals in the Visible and Ultra-Violet. H. Fröhlich ... 2344
Photochemistry of Phosphine. H. W. Melville ... 2362
Absorption of Cobaltous Compounds. Part IV. Alkali Oxide Boric Oxide Glasses. W. R. Brode ... 2422
Broadening of the Ultra-Violet Absorption Bands of Xenon under Pressure. J. C. McLennan and R. Turnbull ... 2423
New Band in Spectrum of OH Molecule. H. L. Johnston, D. H. Dawson and Margery K. Walker ... 2424
Absorption of Substituted Benzols. Parts II and III. Xylidines and Xylenols. H. Conrad-Billroth ... 2425
Absorption of Carbon Compounds in the Schumann Region. G. Scheibe, F. Povenz, and C. F. Linström ... 2426
Optical Investigations of Perylene and its Derivatives. Part IV. Ultra-Violet Absorption Spectrum of 1 : 12-Derivatives and of Isomerides. Cheng Huachih and H. Conrad-Billroth ... 2427
Absorption of the Halogen Derivatives of Methane in the Near Ultra-Violet and their Dissociation Energies. T. Iredale ... 2428
Absorption Band of Ozone between 3050 Å and 2150 Å. Ny Tsi-Ze and Choong Shin-Piaw ... 2429
Elementary Processes of Photochemical Dissociation. L. Goldstein ... 2959
Ultra-Violet Absorption Bands of Ammonia. J. K. Dixon ... 3028
Spectroscopic Events in the Explosion Zones of Methane and other Hydrocarbons. F. J. Lauer ... 3030
Silver Filter for Ultra-Violet Light. G. C. Brock ... 3479
Absorption of Ultra-Violet Light by Organic Substances. W. Gabryelski and L. Marchlewski ... 3577
Absorption of Ultra-Violet Light by Organic Substances. L. Marchlewski and T. Surzycki ... 3578
Significance of Ultra-Violet Absorption Bands of Alkali Halides. W. Klemm 3580
Ultra-Violet Absorption of Benzene Derivatives. Part II. K. L. Wolf and O. Strasser ... 3581
Ultra-Violet Absorption Spectrum of Oxygen. L. Herman ... 3582
Optical Rotatory Power. Part IV. Rotatory Dispersion of Bornyl and Menthyl Xanthates, Especially in the Region of Absorption. T. M. Lowry and H. Hudson ... 4068
Absorption Spectrum of Sulphur Dioxide. A. Jonescu ... 4522
Absorption Spectrum of Diatomic Bismuth. G. M. Almy and F. M. Sparks ... 4523
Absorption Spectrum of Chlorine Dioxide. Z. W. Ku ... 4524
New Type of Diffuse Molecular Spectrum; Light Absorption and Photochemical Decomposition of Chromyl Chloride Vapour. R. de L. Kronig, A. Schaafsma and P. K. Peerlkamp ... 4525
Quantitative Optical Determination of Photochemical Reaction Products. E. Miescher ... 4881
Extension of the Ultra-Violet Absorption Spectrum of Ozone towards the Longer Wave-Lengths. D. Chalonge and (Mme.) L. Lefebvre ... 4936
Absorption Bands of Complex Salts. R. Samuel, A. A. H. Khan and N. Ahmad ... 4937
New Absorption Band in Alkali Halide Crystals. R. Hilsch and R. W. Pohl ... 4938

For the Key to this Index see pp. 1358 to 1372.

Spectroscopy, *continued.*

Abstract Nos.

Extinction Curve of Alkaloids of the Quinoline Group. I. Manta 4939

Absorption Spectra of Burning Hydrocarbons. A. Egerton and L. M. Pidgeon 4940

Theory of Multiple Bonds. A. Burawoy 5105

Change in the Absorption Spectrum of Cobalt Chloride in Aqueous Solution with Increasing Concentration of Hydrochloric Acid. O. R. Howell and A. Jackson 5337

See also 233, 234, 4501 *under* 2 (*d*) ; 623, 3579, 4932, 4933, 5328 *under* 3 (*b*) ; 610 *under* 3 (*c*) ; 624, 1901 *under* 3 (*e*) ; 2432 *under* 3 (*f*) ; 626, 2434, 4531 *under* 3 (*g*) ; 4534 *under* 5.

(*e*) *Analysis of Band Spectra.*

Temperature of the Auroral Region Determined by the Rotational Series of the Negative Nitrogen Bands. L. Vegard 152

Rotational Analysis of the First Negative Bands of the CO^+ Molecule. R. F. Schmid 246

CH Band 3143 Å. T. Heimer 619

Bands due to the Hydrogen Molecule : the $2p^3\Pi$ Bands of Hydrogen. I. Sandeman 621

Absorption Spectrum of Iodine Bromide. W. G. Brown 622

Rotational Analysis of Ultra-Violet Bands of Silicon Monoxide. P. G. Saper 624

Mass Ratio of the Boron Isotopes from the Spectrum of BO. F. A. Jenkins and A. McKellar 819

Rotation-Vibration Spectrum of Acetylene. W. Lochte-Holtgreven and E. Eastwood 1060

Structure of the Third Positive Group of CO Bands. G. H. Dieke and J. W. Mauchly 1505

Auxochrome Effect. M. Horio 1901

Quantum Mechanics of Beryllium Hydride. C. E. Ireland 2430

Spectrum of H_2-Bands Ending on $2p^3\Pi$ Levels. Part II. O. W. Richardson and P. M. Davidson. Part III. O. W. Richardson and P. M. Davidson, with an Appendix by (Miss) J. Marsden and W. M. Evans 2431, 4942

Regularities amongst Hydrides. A. Krebs 3029

Calculation of Thermodynamic Quantities From Spectroscopic Data. A. R. Gordon and C. Barnes 3112

Free Energy of Steam and Carbon Dioxide. A. R. Gordon 3113

Symmetrical Vibrations. A. D. Fokker 3583

Luminous Reduction of Selenium Dioxide. H. J. Emeléus and H. L. Riley 3584

Free Energy of Ozone. L. S. Kassel 3703

Resolution of the Two Difference Bands of CO_2 Near 10 μ. E. F. Barker and A. Adel 4103

Rotational Analysis of the Perturbed $(13, 15)^2\Sigma - {}^2\Sigma$ N_2^+ Band. A. E. Parker 4105

Classification of Unrecorded Band-Systems of Neutral OH Determination of the Constants. T. Tanaka and Z. Koana 4526

New Band System of Beryllium Oxide and the Structure of the BeO Molecule. Luise Herzberg 4527

Band Spectrum of Ionised Cadmium Hydride. E. Svensson and F. Tyrén 4941

Spectrum of H_2, $3d^1\Delta$ and $4d^1$ Levels. O. W. Richardson and P. M. Davidson 4943

See also 1033 *under* 1 ; 1494 *under* 3 (*a*) ; 241, 560, 3023, 3571, 4098, 4099, 4100, 4101, 4515, 4516, 4517, 4518, 4519, 5329 *under* 3 (*b*) ; 611, 1500, 1884, 2419, 2420 *under* 3 (*c*) ; 614, 615, 1057, 1899, 1900, 2424, 3030 *under* 3 (*d*) ; 4534 *under* 5 ; 4948 *under* 6.

(*f*) *Intensities in Band Spectra.*

Optical Determination of Temperature in Discharge Tubes. L. S. Ornstein and P. J. Haringhuizen 328

Quantum-Mechanical Calculation of the Intensities of Infra-Red Bands. K. Scholz 625

Relative Abundance of the Carbon Isotope, C^{13}. F. A. Jenkins and L. S. Ornstein 1252

Intensities of Band Spectra of Phosphors. H. Nitka 2432

Modification of Intensity Distribution in the Band Spectrum of Nitrogen. J. Okubo and H. Hamada 2433

Intensity Distribution in the Spectrum of Beryllium Oxide. R. C. Johnson and E. G. Dunstan 4528

Intensities of Bands in the Spectrum of Boron Monoxide. A. Elliott 4529

Intensity Distribution in a Band System of Symmetrical Triatomic Molecules. Z. W. Ku 4530

For the **Key** to this Index see pp. 1358 to 1372.

Spectroscopy, *continued.*

Abstract Nos.

Intensity Measurements on the Band Spectrum of Helium. R. C. Johnson and R. C. Turner 5338
See also 1040, 2411, 4922 *under* 2 (*f*); 241, 4516 *under* 3 (*b*); 243, 1055, 1884 *under* 3 (*c*); 39, 1900, 2425, 2429, 2959 *under* 3 (*d*); 152 *under* 3 (*e*); 4944 *under* 3 (*g*); 3034 *under* 4 (*a*); 2451 *under* 9.

(*g*) *Theoretical Papers on Band Spectra.*

Products of Dissociation in Nitrogen. J. Kaplan 247
Calculation of the Quantum Defect for Highly Excited S States of Para- and Ortho-Helium. L. P. Smith 248
Vibration of Polyatomic Molecules. N. Rosen and P. M. Morse 249
Specific Heats of Diatomic Gases Using Quantum Statistics. C. Gregory 274
Interpretation of the Ultra-Violet Absorption Bands of Alkali Halides. M. Born 626
Energy of Ground State of Methane. H. J. Woods 1061
Quantum Theory of Spontaneous Disintegration of Diatomic Molecules. G. Müller 1062
Rotational Uncoupling, with Application to the Singlet Hydrogen Bands. P. M. Davidson 1063
Theory of Vibrational Isotope Effects in Polyatomic Molecules. E. O. Salant and J. E. Rosenthal 1506
Repulsion Exponents of Alkali Hydrides. A. Krebs 1507
Normal State of the Helium Molecule-Ions He$_2^+$ and He$_2^{++}$. L. Pauling 1508
Theory of the Continuous Spectrum of the Hydrogen Molecule. L. Goldstein 1902
Potential Energy Curves of Mercury Hydride. R. Rydberg 1903
Position of the Absorption Spectra of Photochemically-Coloured Alkali Halogen Crystals. H. Fröhlich 2434
Interpretation of the Spectra of Polyatomic Molecules. L. Tisza 3031
Energy of Short-Lived Atomic Encounters. W. Kuhn and H. Martin 3032
Normal State of the Hydrogen Molecule-Ion. B. N. Dickinson 3033
Band-Spectra of Diatomic Molecules. W. Jevons 3585
Infra-Red Energy Levels of the H$_2$O Molecule. K. Basu 3587
Band Spectra and Molecular Structure. Part I. W. Weizel 3588
Predissociation and the Crossing of Molecular Potential Energy Curves. O. K. Rice 3589
Normal State of the Hydrogen Molecule. S. Weinbaum 3935
Mass Ratios of the Lithium Isotopes from the Spectrum of Li$_2$. A. McKellar 4531
Excitation of Band Systems. L. S. Ornstein and G. O. Langstroth 4944
Continuum in the Emission Spectrum of Potassium Hydride. T. Hori 5339
See also 1895, 3019, 3561, 3562, 4514 *under* 2 (*h*); 610, 1884, 2418, 2420 *under* 3 (*c*); 2344, 3580, 4525 *under* 3 (*d*); 621, 2430, 2431, 4942 *under* 3 (*e*); 4530 *under* 3 (*f*); 631 *under* 4 (*b*); 4876 *under* 5; 253 *under* 7.

4. Continuous Spectra.

(*a*) *Continuous Emission.*

Formation of Negative Ions According to Quantum Mechanics. Y. Rocard 628
Theory of the Dispersion and Absorption of Helium. J. A. Wheeler 1877
Continuous Spectrum of Sodium. H. Hamada 2435
Attempts to Observe an Electron Affinity Spectrum. O. Oldenberg 2436
Continuous Electron Affinity Spectrum of Hydrogen. C. K. Jen 2437
Effect of Helium on the Continuous and Secondary Spectra of Hydrogen. A. S. Roy 3034
Recombination Radiation in the Cæsium Positive Column. F. L. Mohler 4106
Comparison of the Distribution of Energy in the Continuous Spectra of the Blue and Violet Glows of Molecular Hydrogen. D. Chalonge and E. Vassy 4107
H.F. Discharge in Argon. Part II. Spectral Properties. S. P. McCallum, L. Klatzow and J. E. Keyston 4197
Continuous Gas Spectra. Part II. W. Finkelnburg 4532
Intensity of the Radiation from Uniform Columns in Discharge-Tubes. J. S. and E. W. Townsend 4533
See also 590, 1880 *under* 2 (*a*); 230, 329, 330, 3536, 3538, 3540 *under* 2 (*b*); 1489 *under* 2 (*d*); 4922 *under* 2 (*f*); 1986, 1987, 3023, 3025, 4097, 4932 *under* 3 (*b*); 3584 *under* 3 (*e*); 1902, 5339 *under* 3 (*g*); 627 *under* 5.

(*b*) *Continuous Absorption.*

Spectroscopic Determination of Electron Affinities. H. Kuhn 250

Spectroscopy, *continued*.

Abstract Nos.
Absorption Spectra of Saturated Halides of Multivalent Elements. A. K. Datta and M. N. Saha 629
Absorption Spectra of Saturated Halides. S. C. Deb 630
Absorption Spectra of Some Alkali Fluorides and Heat Dissociation of Fluorine. M. S. Desai 631
Absorption Spectra of Lithium Halides and Latent Heat of Evaporation of Lithium. M. S. Desai 632
Theory of Continuous Absorption of Oxygen at 1450 Å. E. C. G. Stueckelberg 633, 4110
Continuous Absorption Spectra of Polyatomic Molecules. Y. Hukumoto 1904
Photochemical Decomposition of Chlorine Monoxide between 2350 and 2750 Å and the Significance of the Absorption Spectrum in this Region. H. J. Schumacher and R. V. Townend 2365
Continuous Absorption of Oxygen between 1750 and 1300 Å and its Bearing upon the Dispersion. R. Ladenburg and C. C. van Voorhis 2438
Continuous Absorption Spectrum of Polyatomic Molecules. Y. Hukumoto .. 3035
Variation with Temperature of the Continuous Absorption Spectrum of Diatomic Molecules: Part I. Chlorine. (Experimental.). G. E. Gibson and N. S. Bayliss. Part II. Theoretical. G. E. Gibson, O. K. Rice and N. S. Bayliss 4108, 4109
Photographic Photometry Methods of Measuring the Absorption of Solutions in the Visible Spectrum. F. W. Beyer 4111
Effect of Light on Rubidium Iodide Vapour. M. S. Desai 4882
Absorption Spectra of Solutions of Iodine Bromide, Cyanogen Iodide and Cyanogen Bromide. A. E. Gillam 4945
Absorption of NaCl, KCl and KI in the Far Ultra-Violet. A. Smith 4946
Continuous Absorption Spectrum of Helium. J. P. Vinti 4947
See also 1489 *under* 2 (*d*); 560, 4932 *under* 3 (*b*); 613, 615, 1059, 1854, 1887, 2959 *under* 3 (*d*); 1902 *under* 3 (*g*); 4532 *under* 4 (*a*).

5. Fluorescence and Phosphorescence Spectra.

Luminescence of Solid Nitrogen. J. Kaplan 251
Air Afterglow and Active Nitrogen. J. K. Robertson 627
Regularities in the Line Spectra of Solids. R. Tomaschek 634
Spectra of Chromium in Crystals. O. Deutschbein 1064
Resonance Spectrum of Hydrogen. K. R. Rao and J. S. Badami 1065
Radiation Diffusion and Rapidity of Escape of Resonance Radiation from a Gas. C. Kenty 1509
Equivalent Absorption Coefficient for Diffused Resonance Radiation. M. W. Zemansky 1510
Fluorescent Excitation of Mercury by the Resonance Frequency and by Lower Frequencies. Part V. (Lord) Rayleigh 2439
Fluorescence Yield from the L_{III} Level of Uranium. R. J. Stephenson 2440
Thermoluminescent Spectrum of Calcite. S. Iimori 2948
Distribution of Energy in the Fluorescence Bands of Mercury Vapour. I. Mrozowska 3036
Intensity Variation in Fluorescence Series of Sodium. W. G. Brown 3590
Fluorescent Spectra and Chemical Structure of Naphthalene Derivatives. A. J. Allen, Rachel Franklin and Ellice McDonald 3591
Excitation Function of the Hg Resonance Line, 2537 Å. L. S. Ornstein, H. Lindeman and J. Oldeman 3592
Frequency Distribution of Resonance Radiation. R. W. Ditchburn 3593
Efficiency of the Chemiluminescence Accompanying Oxidation of Grignard Compounds. C. D. Thomas and R. T. Dufford 4054
Transmission of Resonance Radiation through a Gas. R. W. Ditchburn 4112
Excitation of Resonance Series in Sodium Vapour by Irradiation with the D-Lines. W. G. Brown and P. Pringsheim 4113
Two New Resonance Series in Antimony Vapour. R. Siksna 4114
Mean Life of the 2^3P_1 State of Cadmium by Photometry of the Resonance Radiation of a Beam of Cadmium Atoms. P. Soleillet 4115
Fluorescence with Atomic Lines of Antimony Vapour. R. Siksna 4116
Polarisation of Resonance Radiation. P. Soleillet 4475
Absorption and Fluorescence Spectra of the Acid Sulphates of Quinine and its Derivatives. L. J. Heidt and G. S. Forbes 4534
Fluorescence of Gaseous Formaldehyde. S. Gradstein 4872

For the Key to this Index see pp. 1358 to 1372.

Spectroscopy, *continued.*

Abstract Nos.

Conservation of Moment of Momentum and Polarisation Rules in Spectroscopy. Application to Light Scattering and Fluorescence. A. Kastler 4876
See also 3009, 3011 *under* 2 (*d*); 5320 *under* 2 (*g*); 4932 *under* 3 (*b*); 3584 *under* 3 (*e*).

6. Zeeman Effect.

Zeeman Effect of Perturbed Terms in the CO Ångstrom Bands. W. W. Watson 636
Zeeman Effect of Forbidden Dipole-Lines. C. J. Bakker and E. Segrè 1066
Influence of Crystalline Fields on the Susceptibilities of Salts of Paramagnetic Ions. Part II. Iron Group. Especially Ni, Cr and Co. R. Schlapp and W. G. Penney 1213
Atomic Energy Levels and Zeeman Effect. D. R. Inglis and N. Ginsburg 1905
Zeeman Effect in Solids. F. H. Spedding 1906
Zeeman Effect of Lead II, III and IV. J. B. Green and R. A. Loring 2441
Action of a Magnetic Field on the Absorption Lines of I_2. I. I. Agarbiceanu .. 3037
Zeeman Effect in the Arc Spectrum of Nickel. H. H. Marvin and A. R. Baragar 3594
Zeeman Effect for Perturbed N_2^+ Terms. A. E. Parker 4117
Absence of Inertia in the Dia-Magnetic Faraday Effect. W. Hanle 4870
Rotation Structure and Zeeman Effect of NH-Bands. H. Batsch 4948
Magnetic Rotation Spectrum of the Red Bands of Sodium. W. R. Fredrickson and C. R. Stannard 5267
Analysis of Zeeman Patterns. R. A. Fisher 5340
Paschen-Back Effects in the Spectra of Thallium. A. M. Crooker 5341
See also 588 *under* 1; 1036, 4916 *under* 2 (*b*); 599 *under* 2 (*e*); 2412, 3016 *under* 2 (*g*); 4096 *under* 2 (*h*); 4101 *under* 3 (*b*).

7. Stark Effect.

Singlet Principal System of Mercury. Y. Ishida and S. Hiyama 252
Theory of Uncoupling and Formulæ for the Stark Effect in H_2. J. K. L. MacDonald 253
Stark Effect with Sudden Changes of Field. H. R. v. Traubenberg, R. Gebauer and E. Schrödinger 254
Stark Effect for Xenon. H. W. Harkness and J. F. Heard 1907
Stark Effect in Hydrogen. L. Kassner 2442
Wave Mechanical Theory of Refraction. J. A. Wasastjerna 2797
Stark Effect. E. U. Condon 3038
Stark Effect in Krypton. N. Ryde 3595
Precision of the Measurement of the lo Surdo Stark Effect Patterns. Y. Ishida and T. Tamura 4535
Treatment of the Stark Effect by the Methods of the Perturbation Theory. W. v. Koppenfels 4536
Pressure Effects in the Spectra XeI and XeII. J. F. Heard 4537
Influence of Electric Fields on the Absorption Spectrum of Potassium. C. J. Bakker 4949
Series of Alkali Atoms in an Electric Field. E. Segrè and G. C. Wick 4950
See also 1034 *under* 2 (*b*); 1492, 4096 *under* 2 (*h*); 1066 *under* 6.

8. Raman Effect.

(*a*) *Gases and Vapours.*

New Isotopic Effect. L. Goldstein 7
Scattering Processes of Higher Order. P. Güttinger 183
Raman Effect and Free Rotation about a Bond. K. W. F. Kohlrausch 635
Raman and Infra-Red Spectra of CO_2. A Langseth and J. R. Nielsen 1067
Raman Spectrum of Carbon Dioxide. A. Langseth and J. R. Nielsen 1068
Raman Effect of Certain Inorganic Halides in the Liquid and Gaseous States. H. Braune and G. Engelbrecht 1069
Calculation of the Characteristic Vibrations of Organic Chain-Molecule Models. E. Bartholomé and E. Teller 1070
Circular Polarisation of Raman Lines. Part II. W. Hanle 1071
Raman Effect of CO. E. Amaldi 1072
Raman Effect. A. Ganguli 1511
Bibliography of the Raman Effect, 1930-1932. S. C. Sirkar 1908
Calculation of the Characteristic Vibrations of Organic Chain-Molecule Models. K. W. F. Kohlrausch 2443
Rotation Structure of the Raman Bands of Polyatomic Molecules. G. Placzek and E. Teller 3039

Spectroscopy, ***continued.***

Abstract Nos.

Raman Spectrum of Gaseous Ammonia. E. Amaldi and G. Placzek 3040
Intensity Relations in the Raman Spectra of Hydrogen. Part II. S. Bhagavantam 3596
Raman Spectrum of Water Vapour. D. H. Rank 3597
Rotational Raman Spectrum of O_2 at High Pressures. B. Trumpy 4538
See also 4927 *under* 2 (*h*); 3027, 3568, 4102 *under* 3 (*a*); 612, 4104 *under* 3 (*c*); 3031 *under* 3 (*g*); 1088, 3567 *under* 9.

(*b*) *Liquids.*

Raman Spectrum of Germanium Tetrachloride. R. R. Haun and W. D. Harkins 255
Vibration of Atoms at the End of Organic Molecules: Raman Effect and the Carbon-Chlorine Bond. W. D. Harkins and R. R. Haun 256
Raman Effect in Solutions of Cupric Salts. A. da Silveira 257
Raman Effect in Perchlorates. Z. Ollano 637
Raman Spectra of Dimethyl Ether, Diethyl Ether, and Heptane. S. C. Sirkar 1073
Polarisation of Light-Scattering. S. Venkateswaran 1074, 1911
Ions of Type $M(OH)_n^{x+}$ in the Raman Effect. Z. Ollano 1075
Raman Spectra of Napthalene Derivatives. S. Ziemecki 1076
Molecular Scattering of Light from Ammonia Solutions. Fine Structure of a Vibrational Raman Band. J. W. Williams and A. Hallaender 1077
Raman Spectra of a Series of Normal Alcohols and Other Compounds. R. W. Wood and G. Collins 1078
Raman Effect of Molecular Types XY_6 and XY_5. O. Redlich, T. Kurz and P. Rosenfeld 1079
Molecular Symmetry and Diffusion Spectra. J. Cabannes 1080
Molecular Diffusion of Light. A. Rousset 1081
Raman Band in Water. G. Bolla 1082
Influence of Ions on the Raman Bands of Water. N. Embirikos 1083
Existence of a Continuous Raman Effect in Liquids. R. Bär 1084
Raman Effect in Organic Nitrates. A. S. Ganesan and V. N. Thatte 1085
Overtone $\Delta v = 1539$ in the Raman Spectrum of CCl_4. L. S. Ornstein and J. J. Went 1086
Raman Spectrum of Ammonia in Aqueous Solution. A. Langseth 1512
Raman Spectra of Diphenylmethane, Aliphatic Bromides and Mercaptans. Elizabeth A. Crigler 1513
Relative Intensities of Lines in Raman Spectra of Benzene-Toluene Mixtures. Elizabeth A. Crigler 1514
Deviations from the Sum Rule for Strontium. W. Kast 1515
Raman Effect in Liquids. A. Carrelli and J. J. Went 1516
Raman Effect in Organic Sulphides and Some Thio-Compounds. V. N. Thatte and A. S. Ganesan 1517
Raman Effect for Liquid and Solid Carbon Dioxide. J. C. McLennan and H. D. Smith 1518
Molecular Rotation in Liquids. S. P. Ranganadham 1909
Raman Effect with Derivatives of a-Ethylene Oxide. R. Lespieau and (Miss) B. Gredy 1910
Raman Spectra of Isomeric Paraffin Derivatives. Part II. H. Kopper, R. Seka and K. W. F. Kohlrausch. Part III. A. Dadieu, A. Pongratz and K. W. F. Kohlrausch 2444, 2445
Depolarisation of Raman Lines from Liquids. J. Cabannes and A. Rousset .. 2446
Raman Spectra of Unsaturated Cyclic Hydrocarbons. M. Godchot, E. Canals and Germaine Cauquil 2447
Raman Effect and Ethylenic Linkage: Hexenes. (Miss) H. van Risseghem, (Miss) B. Gredy and L. Piaux 2448
Raman Spectra of Alkali Metal Nitrates. H. Nisi 3041
Raman Effect in Glycerin. R. Bär 3042
Raman Spectra of Monobasic Organic Acids. K. W. F. Kohlrausch, F. Köppl and A. Pongratz 3043
New Raman Bands of Water. G. Bolla 3598
Raman Spectra of Heterocyclic Organic Compounds. M. Milone and G. Müller 3599
Raman Spectra of Iodides. Part II. Ethyl, Propyl and Isobutyl Iodides. N. G. Pai 3600
Raman Effect of Aqueous Nitrate Solutions. P. Grassmann 3601
Width of the Raman Line $\Delta v = 992$ cm.$^{-1}$ of Benzene. P. Grassmann 3602
Structure of Principal Raman Line of Benzene. L. and E. Bloch 3603

Spectroscopy, *continued.*

Abstract Nos.

Vibration Spectra and Structure of the Cyanogen Halides. W. West and Marie Farnsworth 3604

Raman Spectra of Ring Compounds. Part I. Mono-Substituted Benzene Compounds. J. W. Murray and D. H. Andrews 3605

Comparative Intensity Measurements on the Raman Lines of Inorganic Ions. I. Hansen-Damaschun 4118

Two New Raman Bands of Water. M. Magat 4119

Raman Spectra of Oximes. G. B. Bonino and R. Manzoni-Ansidei 4120

Raman Effect in Complex Cyanides. R. Samuel and M. J. Khan 4121

Raman Spectrum of Tetramethylmethane. D. H. Rank 4122

Influence of Ultra-Violet Absorption on the Relative Intensities of Stokes and Anti-Stokes Lines in the Raman Spectrum. S. C. Sirkar 4539

Raman Spectrum of Calcium Nitrate. E. Bauer, M. Magat and A. da Silveira 4540

Stereo-Isomerism and Raman Effect—Raman Spectra of the Cis and Trans Isomers of Ortho-dimethyl-cyclohexane. O. Miller and L. Piaux 4541

Raman Effect of Sulphuric Acid. L. Médard 5342

Raman Effect in Nitric Acid. L. Médard and H. Volkringer 5343

Depolarisation of the Raman Lines of Liquids. L. S. Ornstein and P. Stoutenbeek 5344

See also 4513 *under* 2 (*h*) ; 612, 1052, 1501, 3286, 3287 *under* 3 (*c*) ; 3581 *under* 3 (*d*) ; 3031 *under* 3 (*g*) ; 7, 635, 1069, 1071, 1908 *under* 8 (*a*) ; 4951 *under* 8 (*c*).

(*c*) *Solids.*

Raman Effect in Molecules and Crystals. E. Fermi 258

Raman Spectrum of SO_4'' in Gypsum. J. Cabannes 1087

Depolarisation of Light Scattered by a Uniaxial Crystal when the Optic Axis and the Scattered Ray are Parallel. J. Cabannes 3044

Dependence of the Intensity of the Raman Scattered Radiation of Quartz on the Exciting Frequency. L. S. Ornstein, J. J. Went and A. H. W. Aten, Jr. ... 3606

Raman Effect in the Sphere of X-Rays. W. Kast and F. Würstlin 3607

Raman Effect at Very Low Temperature. G. B. B. M. Sutherland 4951

See also 1912 *under* 3 (*c*) ; 1908 *under* 8 (*a*) ; 1518, 3041, 3043, 4121 *under* 8 (*b*).

9. Instruments and Apparatus.

Device for Augmenting the Precision of Visual Spectrophotometric Measurements. P. Vaillant 202

Electrodeless Discharge and Sources of Monochromatic Radiation. F. Esclangon 215

Simplified Registering Infra-Red Spectrometer. C. Leiss 225

Quantitative Measurements with the Multiplex Interference Spectroscope. P. Görlich and E. Lau 259

Spectrophotography of "Flash" Sources or of Sources of Low Intensity. W. Kraemer 260

Sparks for Spectrum Analysis. O. Feussner 261

Visual Spectroscopic Method in Heterochromatic Pyrometry. L. S. Ornstein, (Miss) J. G. Eymers and D. Vermeulen 293

Visible Parts of the Auroral Spectrum. L. Vegard 537

Quartz Capillary Arc Lamps of Bismuth, Cadmium, Lead, Mercury, Thallium and Zinc. R. M. Hoffman and F. Daniels 582

Apparatus for the Rapid Measurement of Micro-Photograms. J. Wouda ... 1012

Investigations in the Infra-Red Region of the Spectrum. Part VII. Infra-Red Grating Spectrometer as a Double Monochromator. Part VIII. Application of the Grating Spectrometer to Certain Bands in the Spectra of Triatomic Molecules. A. B. D. Cassie and C. R. Bailey 1088, 3567

Rapid Spectrophotometry of Liquids in the Ultra-Violet Region. F. Twyman 1460

Advantages and Disadvantages of the Dispersion in the Plate Prism of the Lummer-Gehrcke Plate. Magdalena Adam 1479

Mechanical Aid to Analysis of Complex Spectra. G. R. Harrison 1519

Apparatus for the Spectroscopic Studies in the Intermediate Infra-Red Region —20–40 μ. J. Strong 1520

Energy Distribution in Grating Spectra. U. Schmieschek and E. Spiller ... 1521

Large Aperture Spectrograph and Monochromator. O. Schönrock and C. Leiss 1522

Improvements in Microphotography with Ultra-Violet Light. A. Köhler ... 1864

Self-Registering Spectrometer. C. Leiss 1913

Spectroscopy, *continued.*

Abstract Nos.

Relation between the Resolving Power of a Spectroscope and the Principle of Uncertainty. S. Goldman 1914
Influence on the Accuracy of Measurements of Band Heads by Errors in Developing Spectrogram Photographs (Fringe Effect). H. Seeman 1915
Spectral Photometry in the Extreme Ultra-Violet. H. Arens 1916
Kinematographic Study of the Discharge through Discharge Tubes. V. Dolejšek and K. Dráb 2003
Ruling Errors of Diffraction Gratings. P. H. Brodersen and O. Zeising 2449
Spectra of Potassium and Sodium in the Mercury Arc. D. A. Wells and I. Balinkin 2450
Photographic Method of Measuring the Relative Intensities of Spectral Lines. K. B. Thomson and O. S. Duffendack 2451
Calibration of an Infra-Red Spectrometer with a Rock-Salt Prism. P. C. Cross 2452
Recording Infra-Red Quartz Spectrograph. J. W. Ellis 3045
Multiple Prism Glass Spectrograph. D. H. Rank 3046
Focus of a Concave Grating Spectrograph. D. L. MacAdam 3047
Theory of Concave Grating Spectrograph, Especially at Large Angles of Incidence. J. E. Mack and J. R. Stehn 3048
Experimental Investigation of Grating-Ghosts. W. Rudolph 3049
Simple Spectrograph and Infra-Red Absorption Bands of the Solar Spectrum. W. Gorczyński 3424
New Industrial and Research Spectrometer. J. H. Dowell 3510
Construction of a Spectrograph with Large Luminosity. A. C. S. van Heel 3608
Infra-Red Spectrometer. A. Bayle 3609
Large Crystalline Quartz Double Monochromator. W. E. Forsythe and B. T. Barnes 3610
Astigmatism of the Concave Grating. G. H. Dieke 4055
Photographic Plates for Use in Spectroscopy and Astronomy. C. E. K. Mees 4064
Conditions for Securing Accuracy in Spectrophotometry. F. Twyman and G. F. Lothian 4474
Dispersion Measurements upon Potassium Bromide and Potassium Iodide in the Infra-Red. K. Korth 4490
Investigation in the Schumann Region. Part I. Schumann Spectrograph for Precision Measurements. H. Hese. Part II. Simple Fluorite Spectrograph and its Use in Absorption Photographs. A. Rose 4542, 4543
Aberrations of the Concave Grating at Large Angles of Incidence. I. S. Bowen 4544
Adaptation of the Interferometer for Hyperfine Structure. G. S. Monk 4880
Spectral Analysis with Glass Apparatus. W. Kraemer 4952
Hydrogen Ultra-Violet Lamp. O. Darbyshire 4953
Line Shape as a Function of the Mode of Spectrograph Slit Irradiation. D. C. Stockbarger and L. Burns 5345
Short Wave Oscillator for Spectroscopy. H. Pettersson 5346
Arrangement for Determining the Resonance Levels of Mercury. G. Mönch 5402
See also 228, 4914 *under* 1; 3004 *under* 2 (*a*); 2408, 2903, 3540 *under* 2 (*b*); 605, 606 *under* 2 (*e*); 74 *under* 2 (*f*); 236, 1042, 1043 *under* 2 (*g*); 1051, 2417, 3025 *under* 3 (*b*); 242, 1052, 1056, 1883, 3572, 3573, 4520 *under* 3 (*c*); 619 *under* 3 (*e*); 4533 *under* 4 (*a*); 2438, 4111 *under* 4 (*b*); 1065 *under* 5; 1078, 1079, 2446, 3605 *under* 8 (*b*).

10. Unclassified.

Photochemical Decomposition of Phosgene Vapour. F. Almasy and T. Wagner-Jauregg 1003
Quadripole Radiation. A. Rubinowicz and J. Blaton 1089
Qualitative Analysis by Electrolysis and Spectrography. A. Schleicher 1619
Development and State of Quantitative Spectrum Analysis. F. Waibel 1881
Quantum Mechanics and Chemistry with Particular Reference to Reactions Involving Conjugate Double Bonds. H. Eyring 1958
Molecular Heats and Normal Oscillations of Ethane and Ethylene. A. Eucken and A. Parts 2465
Some Infra-Red Interference Spectra. J. W. Ellis 3050
Thermodynamic Functions of Hydrocarbon Gases from Spectroscopic Data. L. S. Kassel 3111
Spectrum Analysis. T. L. de Bruin 3546
Mathematical Methods for Computing Thermodynamic Functions from Spectroscopic Data. L. S. Kassel 4123

Spectroscopy, *continued.*

Abstract Nos.

Empirical Molecular Heat Equations from Spectroscopic Data. W. M. D. Bryan 4124

Quantitative Analysis by Spectroscopic Methods. O. S. Duffendack, R. A. Wolfe and R. W. Smith 4125

Spectrum Analysis and Electrical Investigation of the Purest Platinum. W. Gerlach and Else Riedl 4126

Specific Heat of the Restricted One-Dimensional Rotator. E. Teller and K. Weigert 4590

Spark Ignition of Low Inflammable Gas Mixtures. K. Yumoto 4978

Free Energy, Entropy and Heat Capacity of Bromine and of Hydrogen Bromide from Spectroscopic Data. A. R. Gordon and C. Barnes 4982

Complex Formation due to Polarisation. Part I. System Kr—HCl. Part II. System C_3H_8 — HCl. G. Glockler, C. P. Roe and D. L. Fuller 4984, 4985

Heats of Dissociation of Hydrogen and Nitrogen. W. W. Lozier 5370

Stars.

1. Parallax, Magnitudes, Diameter, Mass, Density.
2. Motions.
3. Spectra.
4. Temperature.
5. Constitution and Evolution.
6. Galactic System.
7. Star Clusters and Clouds.
8. Variable Stars, Binaries and Novæ.
9. Catalogues and Stellar Photography.
10. Unclassified.

1. Parallax, Magnitudes, Diameter, Mass, Density.

Discovery and Observations of Stars of Class Be. Part II. P. W. Merrill, M. L. Humason and Cora G. Burwell 135

Thermionic Amplifier for the Photometry of Stars. A. E. Whitford 506

Representation of Mean Parallaxes by Empirical Formulæ. F. K. Edmondson 509

Reliability of Hypothetical Parallaxes. W. S. Finsen 924

Comparison of Potsdam, Bonn, and Cordoba Photometry with Harvard Photovisual Photometry. Cecilia H. Payne 925

Limiting Magnitude Observable with a Photoelectric Stellar Photometer. S. Smith 926

Dynamical Parallaxes of Double Stars. D. Barbier 1370

Direction and Magnitude of Sun's Motion Referred to Stars of Different Apparent Magnitudes. F. K. Edmondson 2878

Absolute Magnitudes of 792 Stars of Spectra O to A5 Derived from Hydrogen Line Intensities. E. Öpik and Margaret Olmsted 3407

Age of the Universe and of the Earth. E. Belot 3966

Magnitude Frequency Distribution of Wolf-Rayet Stars. D. Hoffleit 3970

Photovisual Magnitudes of the Companion of Sirius. A. N. Vyssotsky 3971

Apparent Distribution of Stellar Luminosities Brighter than 6th Magnitude. E. Öpik, Margaret Olmsted, Georgette Maulbetsch and L. Barnes 4394

Photographic and Photovisual Magnitudes of Stars near the Pole. J. Armeanca 4395

Systematic Corrections to Magnitudes and an Extension of the Polar Sequence. F. H. Seares 4396

Distribution of Space of Draper Catalogue A Type Stars. K. G. Malmquist and L. Hufnagel 4799

Magnitude Definitions in Astronomical Photometry. P. Rossier 4800

Standard Photometric and Visual Magnitude Scales. R. H. Tucker 5204

Distribution of Absolute Magnitudes Among Stars of Spectral Types A, F, G. and K as Determined from Trigonometric Parallaxes. G. Strömberg 5205

Systematic Errors in Trigonometric Parallaxes as a Function of Right Ascension. A. van Maanen 5206

Spectroscopic Determinations of Parallax. A. Kohlschütter 5207

See also 929 *under* 2; 930, 2854, 3410, 3974, 3975 *under* 3; 2857 *under* 4; 1789, 2860 *under* 6; 1377, 3412, 3984 *under* 7; 142, 522, 945, 1792, 1795, 2265, 2865 *under* 8; 2867 *under* 9.

2. Motions.

Stellar Perturbations of Nearly Parabolic Orbits. E. Öpik 125

Momentum Relations in Crossed Fields. L. Page 130

Relation between Total Velocity of Stars and Distance from the Galactic Plane. H. Mineur, Renée Canavaggia and Marie L. Fribourg 136

Determination of Radial Velocities with the Hartmann Spectro-Comparator. H. Nöbel 137

Stellar Radial Velocities. R. O. Redman 510

For the **Key** to this Index see pp. 1358 to 1372.

Stars, *continued.*

Abstract Nos.

Stellar Residual Radial Velocities: Velocity Ellipsoids and Temperature Gradient of the Galaxy. H. and (Mme.) H. Mineur 927
Galactic Rotation Effect in Late-Type Stars. R. O. Redman 928
Proper Motions of Stars in Region of M31. Violet F. White 929
Theory of Streaming in B-Type Stars. K. F. Bottlinger and K. Ogrodnikoff 1371
Space Motions of Stars in Orion and Scorpia-Centaurus Clusters. F. D. Miller .. 2851
Star Streams in Ursa Major. A. Bemporad 2852
Star Streams in the Neighbourhood of 14^h R.A. and 54° Dec. A. Bemporad .. 3408
Apparent Displacements of Polaris. J. Xanthakis 3409
Orbit of a Double Star. L. Gialanella 3972
Star Streams in the Neighbourhood of 16h R.A. and + 54° Dec. A. Bemporad 4397
Star Streams in the Neighbourhood of 13h R.A. and + 52° Dec. A. Bemporad 4801
Use of Hartmann Spectro-Comparator. J. Hartmann 5196
Effect of Errors of Observation on the Spectroscopic Determination of Stellar Rotation. J. A. Carroll 5208
Motions of A-Type Stars. C. Bertaud 5209
See also 4394 *under* 1; 1372, 2261 *under* 3; 940, 2262 *under* 6; 3984 *under* 7; 519, 521, 2265, 2268, 2269, 2864, 4408, 4806, 5223 *under* 8; 1796 *under* 9.

3. Spectra.

Coexistence of Stellar and Interstellar Calcium Lines in the Star H.D. 698. J. A. Pearce 138
Photographic Spectrophotometry. J. Wempe 505
Intensity Distribution in the Spectra of the Brighter Pleiades. H. Strassl 511
Intensity of C_2 and CN Bands in Spectra of R and N Type Stars. K. Wurm .. 512
Space Distribution of Stars of Different Spectral Classes. F. Becker 513
Spectrophotometric Temperatures of 353 Stars. Georgette Maulbetsch 930
Absorption Lines of Hydrogen in Be Stars. O. Struve 931
Period of 12 α^2 Canum Venaticorum. Goldena Farnsworth 932
Four A- and F- Type Stars whose Spectra Contain Variable Absorption Lines. W. W. Morgan 933
Spectrum of the A2 Dwarf ε Serpentis. W. W. Morgan and Goldena Farnsworth 934
Four Stars whose Spectra have Bright Helium Lines. P. W. Merrill 1372
Bright Sodium Lines in a Stellar Spectrum. P. W. Merrill 1373
Emission Line of Hydrogen in the Spectrum of Rigel. O. Struve 1374
Theory of the Darkening at the Limb for β-Lyræ Stars. W. Krat 1375
Hydrogen Line Intensities in Præsepe. Y. Öhman 1376
Properties of Null Geodesics, and their Application to the Theory of Radiation. W. O. Kermack, W. H. McCrea and E. T. Whittaker 1758
Peculiar Spectra in Magellanic Clouds. Annie G. Cannon 2257
Stellar Statistics. P. Rossier 2259
Variations in Structure of the Hydrogen Lines in the Spectrum of H.D. 31293. P. W. Merrill and Cora G. Burwell 2260
Rotational Broadening of Stellar Absorption Lines in Classes B. and O. Christine Westgate 2261
Variable Spectrum of γ Cassiopeiæ. W. J. S. Lockyer 2853
Character of Spectral Lines and Stellar Rotation. G. Shajn 2854
Absorption Lines of N V in Stella Spectra. Cecilia H. Payne 2855
Absorption of Light in Interstellar Space. J. Dufay and Ssu-Pin Liau 3410
Physical Analysis of Wolf-Rayet Spectra. Cecilia H. Payne 3411
Spectrum of the BO Star 23 τ Scorpii. O. Struve and T. Dunham, Jr. 3413
Peculiar Branch of the Spectral Sequence in the Interval B8-FO. W. W. Morgan 3414
Variable Spectrum of γ Cassiopeiae. W. J. S. Lockyer 3973
Spectroscopic Determination of Stellar Rotation and its Effects on Line Profiles. J. A. Carroll 3974
Rotational Speeds of the Stars. J. A. Carroll and L. J. Ingram 3975
Forbidden Lines in Astrophysical Sources. J. C. Boyce, D. H. Menzel and Cecilia H. Payne 3976
Statistical Study of the Rotational Broadening of the Absorption Line *Mg I I* λ 4481 in 413 Stars of Class A. Christine Westgate 3977
Spectra of 17 Leporis and 7 ε Aurigæ. J. A. Hynek 3978
Central Intensities of Fraunhofer Lines. A. D. Thackeray 3994
Spectrum of Red Stars Belonging to Types M and N. G. Piccardi 4398
Relative Intensities of Interstellar Calcium and Sodium Lines. C. S. Beals .. 4399

For the **Key** to this Index see pp. 1358 to 1372.

Stars, *continued.*

Abstract Nos.

Absorption of Balmer Lines in Stellar Spectra. S. Günther 4400
Continuous Hydrogen Absorption in Spectra of Bright Pleiades Stars. Y. Öhman 4401
Classification of Stellar Spectra. O. Struve 4402
Interstellar Absorption. A. Colacevich 4802
Red Titanium Oxide System in α Herculis. N. T. Bobrovnikoff 5210
Variations in the Spectrum of 42 Camelopardalis. D. L. Edwards 5211
Opacity Formulæ and Stellar Line Intensities. H. N. Russell 5212
Intensity and Structure of Spectral Lines. V. F. I. Weisskopf 5317
See also 135, 3407, 3970, 4394 *under* 1; 3409, 5208 *under* 2; 4403, 2866 *under* 4; 1789, 2860 *under* 6; 3983 *under* 7; 142, 522, 1792, 1794, 1795, 2267, 2269, 2864, 3979 *under* 8; 4409 *under* 9.

4. Temperature.

Convection Zones in Stellar Interiors. L. Biermann 139
Greenwich Star Temperature Scale. A. Brill 2856
Effects of Changes in Stellar Temperatures and Absolute Magnitudes. W. W. Morgan 2857
Stellar Colours. A. Brill 2866
Colour of Eros and Southern Primary Reference Stars and Solar Parallax Errors due to Atmospheric Dispersion. H. Horrocks 2877
Discontinuities in Colour Equivalents of Stars. A. Brill 4403
Calcium Ionisation Temperature of the Sun. R. v. d. R. Woolley 5226
See also 135 *under* 1; 505, 511, 512, 930, 1376, 3411, 5212 *under* 3; 935, 2858 *under* 5; 2860 *under* 6; 1377, 3412 *under* 7; 945, 3979 *under* 8; 2866 *under* 9.

5. Constitution and Evolution.

Transmutation of Elements in Stars. G. Steinsholt 127
Schwarzschild-Milne Model of the Outer Layers of a Star. Part II. E. Hopf 140
White Dwarf Stars. E. A. Milne 141
Radiative Equilibrium of Planetary Nebula. V. A. Ambarzumian 919
Boundary Temperature of a Star. E. A. Milne 935
Numerical Integration of Emden's Equation Index 3. N. Fairclough 936
Applications of Degenerate Statistics to Stellar Matter. D. S. Kothari 937
Theory of Stellar Structure. Part II. Energy Generation. E. A. Milne 938
State of Matter in the Interior of Stars. S. Chandrasekhar 939
Origin of the Solar System. F. Nölke 1366
Simple Derivation of the Dissociation Formula. D. H. Menzel 1787
Graphical Method for the Integration of Emden's Equation. J. Dick 2770
Upper Limits of Density and Temperature in a Star. (Second Paper.) A. S. Eddington 2858
Equilibrium of Distorted Polytropes. S. Chandrasekhar 2859, 3416, 4404
Mean Free Path in Rare Ionised Gases. V. C. A. Ferraro 3339
Oscillations in the Photosphere of a Rotating Star. M. Kurihara 3415
Influence of Neutrons on the Internal Structure of the Stars. S. Flügge 3417
Condensation in Stellar Atmospheres. R. Wildt 3980
Transmission of Resonance Radiation Through a Gas. R. W. Ditchburn 4112
Hydrogen Content of the Stars and their Equation of State. G. G. Cillié 4405
Density of Energy in the Universe. S. A. Korff 4406
Coefficients of Absorption and Opacity of a Partially Degenerate Gas. Bertha Swirles 4407
Schwarzschild's Problem of the Gaseous Sphere. N. R. Sen and N. K. Chatterjee 4803
Interpretation of the Hertzsprung-Russell Diagram. B. Strömgren 4804
Stellar Atmospheres. L. Biermann 5213
Dissociation of Molecules in Atmospheres of Stars in Main Sequence. Yvonne Cambresier and L. Rosenfeld 5214
Dissociation of Molecules in Atmospheres of Carbon Stars. L. Rosenfeld 5215
Equilibrium Theory of Abundance of Elements: Statistical Investigation of Assemblies in Equilibrium in which Transmutations Occur. T. E. Sterne 5216
Liberation of Energy by Transmutation of Nuclei in Stars. T. E. Sterne 5217
Equilibrium of Transmutations in Stars in which Transmutations are an Important Source of Energy. T. E. Sterne 5218
Statistical and Dynamical Aspects of the Fission Theory. W. Markowitz 5219
See also 509, 3970 *under* 1; 3409 *under* 2; 2854, 3411, 5212 *under* 3; 2860 *under* 6; 1794, 3979 *under* 8.

Stars, *continued.*

6. Galactic System.

Abstract Nos.

Possible Globular Clusters in Andromeda Nebula (M31). J. H. Reynolds 507
Criterion for Existence of General Interstellar Absorption. A. Brill 514
Absorption of Light in the Galactic System. P. van de Kamp 515
Spectral Types of Faint Stars in Kapteyn's Selected Areas 1-115. M. L. Humason 516
Rotation of the Milky Way. K. F. Bottlinger 940
Distribution of Absorbing Galactic Matter. H. Mineur and A. Machiels 941
Brightness of Extra-Galactic Nebular and Galactic Absorption of Light. J. Dufay 1783
Galactic Dimensions. H. Shapley 1788
Absorption and Space Reddening in Galaxy as shown by the Colours of Globular Clusters. J. Stebbins 1789
Distances and Motions of Extra-Galactic Nebulæ. H. Knox-Shaw 2256
New Method of Determination of Galactic Rotation. H. Mineur 2262
Problem of Diffuse Matter in the Galaxy. J. S. Plaskett and J. A. Pearce 2860
Space Distribution of Stars in Two Fields. F. Becker 2861
Luminosity Distribution and Average Density of Matter in Twenty-Five Groups of Galaxies. H. Shapley 3981
Absorption and Space Reddening in the Galaxy from the Colours of B-Stars. J. Stebbings and C. M. Huffer 3982
Galactic Rotation Effect on Radical Velocities of Late Type Stars. H. Nordström 5220
Theory of Rotation of the Galaxy. B. Lindblad 5221
See also 3970, 5204 *under* 1 ; 136, 927 *under* 2 ; 513, 2257 *under* 3 ; 517, 2862 *under* 7 ; 4409 *under* 9.

7. Star Clusters and Clouds.

Local Star System. F. Becker 517
Study of Star Colours and Magnitudes in Open Cluster Messier 38 (N.G.C. 1912). A. Wallenquist 1377
Distribution of Absolute Luminosities in Globular Clusters. P. ten Bruggencate 2263
Rayleigh Scattering in Interstellar Space. O. Struve 2264
Space Distribution of Globular Clusters. P. van de Kamp 2862
Colour Indices and Integrated Magnitudes of Fifteen Bright Globular Clusters. A. N. Vyssotsky and Emma T. R. Williams 3412
Selective Absorption of Light in Pleiades. D. Barbier 3983
Proper Motions of Stars in Region of Cluster M37 (N.G.C. 2099). Violet F. White 3984
See also 3970 *under* 1 ; 510, 929, 2851 *under* 2 ; 4401 *under* 3 ; 940, 941, 1783, 1789, 3981, 3982 *under* 6.

8. Variable Stars, Binaries and Novæ.

Minimum Masses of Seven Spectroscopic Binaries. J. A. Pearce 142
Statistical Properties of Cepheid Variables. Li-Hen 143
Light-Curves of Mira Stars of Spectral Class Me. H. Ludendorff 144
Mean Light-Curves of Long-Period Variables. Part VII. S. Boötis. Part VIII. R. Leonis Minoris. Part IX. χ Cygni. Part X. T. Ursæ Majoris. Part XI. R. Ursæ Majoris. A. A. Nijland 145, 518, 942, 943, 1378
Calculation of the Orbit of a Visual Binary. E. Martin 519
Variation of the Eccentricity of the Problem of Two Bodies of Variable Masses. F. Zagar 520
Orbital Elements of Polaris. A. Belopolsky 521
Spectroscopic Elements of the Eclipsing Variable TX Ursæ Majoris. J. A. Pearce 522
Observations of Eclipsing Variable FV Carinæ. H. L. Alden and E. Whitworth 523
Variation of Eccentricity and Semi-Axis Major of a Spectroscopic Binary. M. H. H. Walters 944
Colours of SS Cygni Variables. B. P. Gerasimovič and Cecilia H. Payne 945
Stars in Field Nine of the International Cepheid List. J. J. Nassau and S. K. Towson 1790
Long Period Variable RT Hydræ. D. J. K. O'Connell 1791
Eclipsing Binaries RW Aræ and SW Ophiuchi. Martha B. Shapley 1792
Three Bright Novæ. L. Campbell 1793

Stars, *continued.*

Abstract Nos.

Suggested Mechanism of Class Be Stars. D. B. McLaughlin 1794

Spectroscopic Elements of Eclipsing Variable, GO Cygni=H.D. 196628. J. A. Pearce 1795

Faint Southern Double Stars with Common Proper Motion. W. J. Luyten.... 2265

Correlation Periodogram Analysis of R Scuti. D. Alter 2266

Spectrum Variable 73 Draconis. W. W. Morgan 2267

Variation in Radial Velocity of *α* Orionis from 1923 to 1931. R. F. Sanford .. 2268

Spectrum and Radial Velocity of U Monocerotis. R. F. Sanford 2269

Periods of the Be Spectrum Variables H.D. 20336 and 52 π Aquarii. D. B. McLaughlin 2270

Extremely Simple Method of Periodogram Analysis. D. Alter 2772

Irregularities of Period of S Boötis and R. Camelopardalis. S. Plakidis 2863

Cepheid " Lag." G. Tiercy 2864

Multiple System of Zeta Cancri. Maud W. Makemson 2865

New Interference Micrometric Method Applicable to Double Stars and Satellites of Jupiter. A. Danjon 3398

Pulsation Theory of Cepheid Variables. J. A. Edgar 3418

Variable Star BD 41° 1044. J. Hopman 3419

Interpretation of Nova Spectra. D. H. Menzel and Cecilia H. Payne 3979

Eclipsing Binary Star RZ Cassiopeiæ. J. Ellsworth 3985

Rapid Method for Determining Visual Binary Orbits. H. N. Russell 4408

Perturbation in the System of Sirius. C. Volet.......... 4805

Orbit of Spectroscopic Double Star, r Persei. L. Gialanella 4806

Two Variable Stars with Double Periods, AI Scorpii and SX Centauri. D. J. K. O'Connell 5222

Orbit of E2294. R. H. Wilson. 5223

System of HD 198287-8. W. H. Christie 5224

Triple System of 13 Ceti. W. J. Luyten.......... 5225

See also 506 *under* 1; 1375, 2853, 3973 *under* 3.

9. Catalogues and Stellar Photography.

Proper Motions and Orbital Motions Obtained from the Astrographical Catalogue of Catania Observatory. A. Bemporad 1796

Trial of a Projection Method for Measuring Photographs. F. Schlesinger and A. L. Bennett 2839

Comparison of Yerkes and Greenwich Photographic Magnitudes. S. Holm.... 2867

Catalogue and Bibliography of Be and Ae Stars. P. W. Merrill and Cora G. Burwell 4409

See also 925, 3407, 4395, 4396, 4797 *under* 1; 510 *under* 2; 2866 *under* 4; 941 *under* 6.

10. Unclassified.

Mechanism of Acquirement of Cosmic-Ray Energies by Electrons. W. F. G. Swann 1872

Method of Projecting Star Images Having Coma and Astigmatism. R. Kingslake and A. B. Simmons.......... 4079

Sun.

1. Chromosphere and Prominences.
2. Corona. Eclipse.
3. Sunspots and Faculæ.
4. Temperature, Radiation and Solar Constant.
5. Parallax, Size, Motion.
6. Spectrum.
7. Magnetism.
8. Unclassified.

1. Chromosphere and Prominences.

Relative Distribution and Abundance of Elements in the Lower Chromosphere. S. A. Mitchell and Emma T. R. Williams.......... 1379

Solar Flocculi Observed with Royal Observatory, Greenwich, Spectrohelioscope during 1932. F. W. Dyson 1797

Heights in the Chromosphere from Fixed and Moving Plates. S. A. Mitchell 2271

Height of Chromosphere in 1932 and Progress of Solar Cycle. G. Abetti...... 2868

Structure of Solar Chromosphere. E. J. Perepelkin.......... 2869

Mean Free Path in Rare Ionised Gases. V. C. A. Ferraro.......... 3339

Solar Granulation. H. Strebel 3986

See also 909, 2870, 2871, 2872 *under* 2.

Sun, *continued.*

2. Corona. Eclipse.

Abstract Nos.
Spectrum of the Solar Corona. T. L. de Bruin 146
Method of Observation of Total Solar Eclipses. P. Salet 525
Effect of Recent Solar Eclipse on the Ionised Layers of the Upper Atmosphere. J. P. Schafer and W. M. Goodall 543
Franklin Institute Eclipse Expedition. J. Stokley 909
Total Solar Eclipse of Aug. 31, 1932. Reports of the British Expeditions. C. R. Davidson, J. Jackson, F. J. M. Stratton and R. L. Waterfield 946
Spectrum of Solar Corona, June 29, 1927. A. Jenvall 1798
Measures of Coronal Streamers. F. de Roy 2272
Eclipse Kinematography. S. A. Korff 2277
Computation of Total Solar Eclipses. L. J. Comrie 2278
Total Solar Eclipse of 1940 October 1. L. J. Comrie 2279
Total Solar Eclipse of August 31, 1932. A. de la B. Pluvinel and D. Barbier 2870
Solar Eclipse Problems. J. H. Moore 2871
Total Eclipse of the Sun, August 31, 1932: Report of the Imperial College Expedition. H. Dingle 2872
Polarisation of Solar Corona Studied Spectroscopically during Eclipse. J. Dufay and H. Grouiller 3420
Photometry of Solar Eclipse Phenomena. C. H. Sharp, S. McK. Gray, W. F. Little and H. J. Eckweiler 3421
Variation of Intensity and Relative Intensity of Coronal Lines. W. Grotrian .. 3987
Effect of a Solar Eclipse on the Earth's Magnetic Field. S. Chapman 4434

3. Sunspots and Faculæ.

Hydrodynamical Interpretation of Solar Periodicity. D. Riabouchinsky 147
Theory of Sunspot Formation. M. Minnaert and A. J. M. Wanders 947
Statistical Study of Solar Faculæ. H. Strebel and B. Thüring 948
Influence of Temperature on Stability of Gyrating Fluids. C. Woronetz 1723
Acquirement of Cosmic-Ray Energies by Electrons. W. F. G. Swann 2383
Symposium on Climatic Cycles. "Introductory Remarks," by J. C. Merriam; "Evidences of Cycles in Tree Ring Records," by A. E. Douglass; "Periodicity in Solar Variation," by C. G. Abbot and (Mrs.) A. M. Bond; "Nature of the Solar Cycle," by W. S. Adams and S. B. Nicholson; "Correlation of Sedimentary and Climatic Records," by I. Bowman 2902
Time-Interval between Solar Phenomena and Terrestrial Magnetic Disturbances. C. Maurain 2913
Eleven-Year Period of Earthquake Frequency. C. Davison 3449
Form of Sunspot. (Miss) P. Parchomenko 3988
Eleven-Year Sunspot Period, Secular Periods of Solar Activity and Synchronous Variations in Terrestrial Phenomena. H. W. Clough 4422
Regularities in the Succession of Solar Phenomena. H. Deslandres 4807
See also **3420** *under* **2**; **2875, 3423** *under* **4.**

4. Temperature, Radiation and Solar Constant.

Measurement of Solar Radiation. A. F. Dufton 148
Ultra-Violet Transmission Coefficient of the Earth's Atmosphere. R. S. Rochwood and R. A. Sawyer 154
Climatology: Solar Radiation in Greenland. C. Maurain and J. Devaux 969
Values of the Constants of the Saha Equation. R. T. Birge 1380
Ultra-Violet Solar Radiation Measurements. W. W. Coblentz, R. Stair and J. M. Hogue 1650
Fraction of Solar Radiation Diffused by the Celestial Vault. L. Gorczynski .. 2273
Intensities of Visible and Ultra-Violet Radiation in Sunlight. W. Kunerth and R. D. Miller 2636
Changes in the Solar Constant. F. Baur 2873
Error in Measurements of Solar Radiation Due to Assumption of Constant Ratio between Radiant Energy Received and Electrical Energy Recorded. H. H. Kimball and I. F. Hand 2874
Solar Radiation in 1929 and 1930. G. Armellini and G. Andrissi 2875
Intensity and Spectral Distribution of Solar Radiation in New Orleans. H. Laurens and H. S. Mayerson 2876
Maximum Day Temperatures and the Tephigram ($t\varphi$ Diagram). E. Gold 2895
Registrations with Ångström's Pyranometer. Parts I and II. E. Hasché 3422

Sun, *continued.*

Abstract Nos.

Influence of Solar Activity on the Earth's Atmosphere. B. Düll 3423
Solar Radiation in 1931 and 1932. G. Armellini and G. Andrissi 3989
Solar Radiation Measurements at Poona in 1931. S. S. Kohli 3990
Use of Glass Colour Screens in the Study of Atmospheric Depletion of Solar Radiation. H. H. Kimball and I. F. Hand 3991
Estimation of Solar Radiation in Relation to Warming Effects on the Human Body. H. M. Vernon 3992
Radiothermic Economy of Fields of Snow and Glaciers. J. Devaux 4003
Measurement of Radiation in the Solar Vertical. R. Knepple 4808
Opacity Formulæ and Stellar Line Intensities. H. N. Russell 5212
Calcium Ionisation Temperature of the Sun. R. v. d. R. Woolley 5226
Solar Activity and Cosmic Rays. V. F. Hess and R. Steinmaurer 5294
See also 1379 *under* 1; 909 *under* 2; 2902 *under* 3; 3424, 3425, 3426 *under* 6; 952 *under* 7.

5. Parallax, Size, Motion.

Determination of Accelerations and Fluctuations in Motions of Sun and Moon. J. K. Fotheringham 524
Present Conception of the Structure of the Universe. E. Freundlich 1778
Colour of Eros and Southern Primary Reference Stars, and Solar Parallax Errors due to Atmospheric Dispersion. H. Horrocks 2877
Direction and Magnitude of Sun's Motion Referred to Stars of Different Apparent Magnitudes. F. K. Edmondson 2878
Absolute Motion of Solar-System and Orbital Motion of the Earth by the Ether-Drift Experiment. D. C. Miller 3366
Oscillations in the Photosphere of a Rotating Star. M. Kurihara 3415
Greenwich Personality and the Equinox Correction. J. K. Fotheringham 3993
Year 1900 as Standard Equinox (Second Paper). E. C. Bower 5194
See also 1797 *under* 1; 2875 *under* 4; 2274 *under* 6.

6. Spectrum.

OH Band λ3064 and the Solar Spectrum. R. W. Shaw 149
Wave-Lengths of H and K Lines of Calcium in Arc in Vacuo and their Red Shifts in Solar Spectrum. C. V. Jackson 949
Photometry of Solar Spectrum Lines. C. D. Shane 950
Measurement and Interpretation of Fraunhofer Lines. S. A. Korff 951
New Method of Using the Spectrograph for Solar Rotation Work. J. Evershed 2274
Hydrocarbon Bands in the Solar Spectrum. R. S. Richardson 2275
Microphotometry of the Solar Spectrum from 4040 Å to 4390 Å. R. v. d. R. Woolley 2276
Sulphur Lines in the Solar Spectrum. K. W. Meissner 2879
Photometric Measures in Atmospheric Oxygen Band A of Solar Spectrum. H. v. Klüber 2880
Simple Spectrograph and Infra-Red Absorption Bands of the Solar Spectrum. W. Gorczyński 3424
Atmospheric Transmission in the Water-Vapour Absorption Bands ϱ and Φ. W. Gorczyński and E. Stenz 3425
Water Vapour Absorption in the Infra-Red Region of the Solar Spectrum. E. Stenz 3426
Central Intensities of Fraunhofer Lines. A. D. Thackeray 3994
See also 1379, 1797 *under* 1; 146, 946, 2870, 2871, 2872, 3987 *under* 2; 1778 *under* 5

7. Magnetism.

Relations of Stellar Electricity and Magnetism to Phenomena of Sun's Atmosphere. R. Gunn 952
Electrical Conductivity of Ionised Gas in the Presence of a Magnetic Field. T. G. Cowling 1153
See also 1797 *under* 1; 1778 *under* 5.

8. Unclassified.

Transmutation of Elements in Stars. G. Steinsholt 127
Velocity of Rotation of Sun at Different Depths. E. J. Perepelkin 1799
Theory of the Bending of Light Rays by the Sun. E. Fruendlich and A. v. Brunn 2809
Terrestrial Reactions to Variations of Solar Activity. A. Nodon 5238

Surface Tension and Cohesion.

1. Cohesion.
2. Surface Tension Theory.
3. Determination of Capillary Constants.
4. Relation between Capillary Constants and Other Properties. Parachor.
5. Films.
6. Electrocapillary Phenomena.
7. Apparatus and Technique.
8. Unclassified.

Cross-References :
For further papers on Surface Phenomena, *see* Adsorption.
For further papers on Cohesion, *see* Thermodynamics, 2.

1. Cohesion.

Abstract Nos.
Influence of Foreign Substances on the Cohesion Limits and Ultramicroscopic Sol-Formation of Synthetic Rock-Salt Crystals. Part III. Heavy Metal Chlorides. W. Metag. Part IV. Density Determinations. J. Köhler 40
Influence of Disturbing Factors and Temperature on Liquid Drops on the Surface of the Same Liquid. L. D. Mahajan 899
Adhesive Forces on Solidification. A. Sellerio. 1761
Experiments on Cohesion. Part IV. Cleavage in Galena. H. Tertsch.... 2154
Rigidity of the Multiple Crystal. W. Kuntze.......... 2170
Automatic Recording of Setting Time of Cement. N. Davey.......... 2827
Magnitude of Liquid Droplets on the Surface of the same Liquid. L. D. Mahajan 3373
Cohesion and Plasticity in Crystals. A. Smekal.......... 4349
See also 1763 *under* 4.

2. Surface Tension Theory.

Adsorption of Paraffin Vapours on Water: Significance of Traube's Rule. H. Cassel and M. Formstecher 1
Volume of the Meniscus at the Surface of a Liquid. A. W. Porter.......... 111
Quantitative Limiting Equation of the Surface Tension of Strong Binary Electrolytes. T. Sakai.......... 494
Quantitative Limiting Equation of the Surface Tension of Strong Binary Electrolytes. S. Oka 495
Theory of Surface Tension of Dilute Electrolytes and the Structure of the Surface Skin. S. Oka 1353
Interfacial Activity and Orientation of Polar Molecules. Part IX. Applicability of Antonov's Rule, Particularly to Adsorbed Films. A. Taubmann 1354
Thermodynamics of Adsorption at the Surface of Solutions. E. A. Guggenheim and N. K. Adam.......... 1559
Behaviour of Organic Liquids between Parallel Plates. K. Schultze.......... 1762
Minimum Capillary Rise in an Ideal Uniform Soil. W. O. Smith.......... 2890
Instability of Liquid Jets. E. Tyler.......... 4359
Hydrodynamics and the Kinetic Theory of Gases; Theory of Surface Tension. Y. Rocard 4378
See also 3377 *under* 3; 902, 2244 *under* 7.

3. Determination of Capillary Constants.

Surface Tension of Ethyl Ether, Acetone, Toluene and Methyl Alcohol at Low Temperatures. T. Tonomura and K. Chujo.......... 112
Adsorption. Part I. Carbon Dioxide, Sulphur Dioxide and Water. Part II. Lower Fatty Acids. R. C. Bosworth.......... 813
Surface Tension of Mercury in a Silica Apparatus. R. S. Burdon.......... 900
Calculation of Surface Tension from Experiment. Part. I. Sessile Drops. A. W. Porter 1355
Maximum Rate of Evaporation of Water. T. Alty.......... 1538
Method for Interpolating Data, Based on Dühring's Rule. J. H. Perry and E. R. Smith 1739
Passage of Mercury through Narrow Capillaries. H. Ebert and W. Ende.......... 1949
Surface Tension Measurements with Non-Aqueous Colloidal Solutions. E. W. J. Mardles.......... 2241
Capillary Depression of Mercury in Cylindrical Tubes and Errors of Glass Manometers. W. Cawood and H. S. Patterson.......... 2242
Allotropy of Liquid Nitrobenzene. E. L. Lind and T. F. Young.......... 2243
Oil-Water Contact Surfaces. J. J. Trillat and L. Leprince-Ringuet.......... 3374
Surface Tension Studies with *n*-Butyl Acetate. E. R. Washburn and C. H. Shildneck.......... 3375

For the Key to this Index see pp. 1358 to 1372.

Surface Tension and Cohesion, *continued*.

Abstract Nos.
Interfacial Tension of Mercury in Contact with Organic Liquids. F. E. Bartell, L. O. Case and H. Brown 3376
Boundary Angle Measurements. Part II. O. Herstad 3377
Surface-Tension Measurements of Solutions of Sodium and Potassium Salts of the Higher Fatty Acids by Means of the Ring-Rupture Method. Parts I and II. A. Lottermoser and E. Schladitz 3378
Capillary Ascent or Depression of Liquids in Cylindrical Tubes. A. W. Porter 3952
Surface Tension of Mercury and of Water in Contact with Saturated Vapours of Organic Liquids. F. E. Bartell, L. O. Case and H. Brown 3953
Surface Tension of Liquids near the Critical Temperature. C. A. Winkler and O. Maass 4379
See also 1762 *under* 2; 113, 908, 2828 *under* 4; 3380 *under* 7.

4. Relation between Capillary Constants and Other Properties. Parachor.

Surface Tension of Malonic Esters and Constitutive Nature of the Parachor. A. B. Beck, A. K. Macbeth and S. W. Pennycuick 113
Experiments with Capillary Jets. E. Tylor and F. Watkin 464
Parachor of Rhenium. H. V. A. Briscoe, P. L. Robinson and A. J. Rudge 901
Boundary Lubrication by Soap Solutions. R. C. Williams 908
Surface Tension and its Measurement. A. Ferguson 1763
Physical Properties of Ethylamine. E. Pohland and W. Mehl 2466
Adsorption in Solutions and Physical Properties of the Solvent. Part II. E. Heymann and E. Boye 2667
Simple Derivations of Some Important Relationships in Capillary Flow. R. K. Schofield 2828
Surface Energy and Evaporation of Droplets. Dorothy J. Woodland and E. Mack, Jr. 4579
Surface Tension and Complex-Formation in Non-Aqueous Salt Solutions. P. P. and N. S. Kosakewitsch 4790
Densities and Parachors of Vinyl Acetate and Its Liquid Polymers. C. Green, J. Marsden and A. C. Cuthbertson 5134
Equation of State and Parachor Relation. A. Eucken 5373
See also 111, 494, 495, 1353, 1762 *under* 2; 112, 2241, 3375, 4379 *under* 3; 1360 *under* 7.

5. Films.

Adsorption of Gases on Solids. R. S. Bradley 2
Mechanical Properties and Structure of Nitrocellulose Films. A. V. Blow 425
Structure of Surface Films. Part XVI. N. K. Adam and J. B. Harding. Part XVII. N. K. Adam. Part XVIII and Part XIX. N. K. Adam and J. G. F. Miller 496, 2670, 5181, 5182
Surface Potentials of Unimolecular Films. Part IV. Effect of Underlying Solution and Transition Phenomena in the Film. J. H. Schulman and A. H. Hughes 497
Viscosity of a Non-Wetting Fluid. M. Reiner and S. Erk 503
Films, Threads and the Science of Colloids. Wo. Ostwald 834
Films: Physics of Membranes. E. Manegold 835
Membrane Equilibria. F. G. Donnan 836
New Investigations on Unimolecular Surface Films. N. K. Adam 837
Investigations on Film Structures by Electrical and Optical Methods. E. K. Rideal 838
Physical Properties and Structure of Films of Lubricant. V. Vieweg 907
Surface Films of Cellulose Derivatives of Aqueous Solutions. N. K. Adam 1269
Shape of Profiles of Liquid Films Draining on a Vertical Wetted Plate, and an Investigation on the Plate Ridge. J. Satterly and E. L. Stuckey 1356
Spreading of Liquids on Solid Surfaces. R. Bulkley and G. H. S. Snyder 1357
Instability of Thick Films of Insoluble Oils on Water. C. G. P. Feachem and E. K. Rideal 1764
Theory of the Monomolecular Adsorption Layer. N. Fuchs 2668
Surface Films of Unsaturated Compounds. A. H. Hughes 2669
Structure of Monomolecular Films. R. J. Fosbinder and Anna E. Lessig 2671, 2672

Surface Tension and Cohesion, *continued.*

Abstract Nos.

Phase Boundary Potentials of Adsorbed Films on Metals. Part I. Oxygen on Gold. H. K. Whalley and E. K. Rideal. Part II. Iodine on Platinum. L. Jacobs and H. K. Whalley. Part III. Interaction of Copper and Iodine Vapour by the Method of Surface Potentials. H. K. Whalley and E. K. Rideal 3277
Equation of State for Monomolecular Films. J. Guastalla 3379, 4588
Solvation of Molecules and the Equation of State of the Adsorption Layer. S. E. Bresler, J. B. Chariton, B. A., and D. L. Talmud 3877
Attraction of Insoluble Substances by Liquid Interfaces. H. Devaux 3954
Surface Films of Cellulose Derivatives on Water and Dyestuff Solutions. Part II. J. B. Harding and N. K. Adam 4314
Shear Elasticity of Water Films. B. Derjaguin 4346
Electrical Properties of Monomolecular Films on Liquids. H. G. Yamins and W. A. Zisman 4380
Mechanical Properties of Adsorption Layers and Stability of Foam and Emulsions. D. L. Talmud 5118
Range of Surface Forces. F. P. Bowden 5180
Orientation of Molecules at Boundary Surfaces. H. Freundlich 5183
See also 1353, 1559 *under* 2; 813, 3374 *under* 3; 1358, 1359 *under* 6; 499, 2103 *under* 7.

6. Electrocapillary Phenomena.

Influence of Picric Acid on the Electrocapillary Curve of Mercury. H. Breindl and K. Söllner 498
Properties of the Becquerel Membranes. J. J. Bikerman 1358
Membrane Processes. K. Söllner 1359
Significance of Capillary Width for the Flow Potential. H. B. Bull 1765
Shape of the Electrocapillary Curve of Mercury in Capillary-Inactive Electrolytes. R. M. Joshi 1766
Electrocapillary Maximum for a Mercury Electrode. S. R. Craxford 3955
Electrophoretic Null-Point for Mercury in Aqueous Solutions. S. R. Craxford 4381
Electrocapillary Experiments. I. G. Walters 5184
Theory of Electrocapillarity. Part I. S. R. Craxford, O. Gatty and J. St. L. Philpot 5185
Electrolytic Cleaning of Metals. B. Kabanow 5432
See also 494, 495 *under* 2.

7. Apparatus and Technique.

Direct Measurement of the Surface Tension of Superficial Solutions Produced by Soluble Substances. A. Marcelin and D. G. Dervichian 499
Adhesion Tension. Receding Contact Angle, Pressure of Displacement Method. F. E. Bartell and C. E. Whitney 902
Measurement of Surface Tension. T. C. Sutton 1360
Surface Tension Balance. R. J. DeGray 1361
Application of Boltzmann's Principle to Certain Kinds of Movement. G. I. Pokrowski 1386
Application of the Gibbs Adsorption Theorem to Solid-Liquid Interfaces. F. E. Bartell, F. L. Miller and E. G. Almy 1667
Binary Liquid Systems and the Mixture Rule. W. MacFarlane and R. Wright 1701
Investigation of Thin Surface Films on Metals by Means of Reflected Polarised Light. L. Tronstad 2103
Capillary Rise at the Boundary and Its Dependence on the Angle of Contact. K. Schultze 2244
Adhesion Tension. F. E. Bartell and H. J. Osterhof 3380
See also 899, 1761, 2827, 3373 *under* 1; 4359 *under* 2; 900, 1355, 2241, 2242, 3374, 3376, 3378, 4379 *under* 3; 1763 *under* 4; 496, 838, 1356, 2669, 2670, 2671, 2672, 4380, 5181, 5182 *under* 5.

8. Unclassified.

Apparatus for Making Minute Glass Instruments. P. de Fonbrune 114
Rotation of Crystals Floating on Liquid Surfaces. P. Gaubert 860
Bubble Formation in Glass Tubes. W. B. Mann and R. W. B. Stevens 1362
Motion of Liquid Drops on Growing Crystals. L. Kowarski 2718
Liquid Drops on the Surface of the Same Liquid. L. D. Mahajan 4791

Surface Tension and Cohesion, *continued.*

Abstract Nos.

Solid-Liquid-Air Contact Angles and Their Dependence upon the Surface Conditions of the Solid. F. E. Bartell and A. D. Wooley 4792
Surface Tension of Solids. W. P. Berdennikow 5186

Temperature, Measurement of.

1. Scales and Standard Temperatures.
2. Thermometers (other than Electrical).
3. Thermometers and Pyrometers (Electrical).
4. Pyrometers (Optical and Total Radiation).
5. Accessories for Temperature Measurement and Control.
6. Unclassified.

Cross-References:
Flame, Ignition, Explosion Temperatures, *see* Thermochemistry, 4.
Temperature of Earth, Air, Sea, *see* Land, Physics of the, 2; Meteorology, 2; Hydrosphere, Physics of the, 1.

1. Scales and Standard Temperatures.

Reduction of Platinum Resistance Thermometers to the International Temperature Scale. G. S. Callendar 652
Temperature and the Principle of Similitude. A. Busemann 1948
Freezing Temperature of Silver. W. F. Roeser and A. I. Dahl 3682
International Comparison of the Temperature Scale between 660° and 1063° C. W. F. Roeser, F. H. Schofield and H. A. Moser 4157
Freezing Point of Iridium. F. Henning and H. T. Wensel 4158
International Comparison of Temperature Scales between 660° and 1063° C. W. F. Roeser, F. H. Schofield and H. A. Moser 4581
Correlation of Heat Capacity, Absolute Temperature and Entropy. G. A. Linhart 5374
See also 2485 *under* 3.

2. Thermometers (other than Electrical).

Adiabatic Method for Precise Electrical Calibration of Thermometers. F. Barry, H. W. Webb and A. K. Smith 292
Dependence of Thermometer Lag on the Viscosity of the Indicating Liquid. W. Grundmann 1540
Passage of Mercury through Narrow Capillaries. H. Ebert and W. Ende 1949
Elimination of Parallax Error in Precision Thermometers. A. Pérard 3090
Errors of Fluid-Pressure Thermometers and their Correction. W. G. Bird 3091
Measurement and Interpretation of Deep Earth Temperatures. C. E. van Orstrand 3433
Estimation of Solar Radiation in Relation to Warming Effects on the Human Body. H. M. Vernon 3992
Extremely Low Temperatures by Adiabatic Demagnetisation of Salt of Rare Earth. W. J. de Haas, E. C. Wiersma and H. A. Kramers, A. Cotton and A. d'Arsonval 4270
Influence of Velocity of Water Current on Thermometer Readings. A. Geldbach and W. Müller 4974

3. Thermometers and Pyrometers (Electrical).

Measurement of Manometric Differences in Level. H. Klumb and T. Haase 66
Temperature Measurements. J. A. Hall and H. Barrell 79
Modifications of Resistance Thermometer Bridge and of Commutator Selector. Marion Eppley 655
Sensitive Recording Altimeter and Thermometer for Aircraft. P. Idrac 882
Coiled-Filament Resistance Thermometers. C. H. Meyers 1123
Theory of Thermopiles and Bolometers. J. Fischer 1124
Brownian Motion of the Resonance Radiometer. G. A. van Lear, Jr. 1328
Method of Producing the Thermoelectric Effect. A. Égal 1950
Reference Tables for Platinum to Platinum-Rhodium Thermocouples. W. F. Roeser and H. T. Wensel 2485
Noble Metal Thermoelectric Thermometer for Very High Temperatures. O. Feussner 2486
Registering Photoelectric Cell Pyrometer. G. Müller and H. J. Zetzmann 2487
Thermel Technique. P. W. White 3092
Electrical Resistance Thermometers as Applied to Human Calorimetry. G. F. Soderstrom 3093
Heating of a Cylindrical Body by Rapid Movement through the Air. E. Brun 4582
See also 652 *under* 1; 4974 *under* 2.

Temperature, Measurement of, *continued.*

4. Pyrometers (Optical and Total Radiation).

Abstract Nos.

Investigation of the Cooling of Glowing Silit Rods by Photographic Pyrometry. R. Hase 287
Visual Spectroscopic Method in Heterochromatic Pyrometry. L. S. Ornstein, (Miss) J. G. Eymers and D. Vermeulen 293
Micropyrometry. G. Lewin, W. W. Loebe and C. Samson 294
Micropyrometry. G. Lewin 295
Coloured Filter for Optical Pyrometers. I. Peychès 653
Radiation from Incandescent Oxides and Oxide Mixtures in the Visible Spectrum. H. Hoppe 1016
Colour Filters for Altering Colour Temperature. Pyrometer Absorption and "Daylite" Glasses. H. P. Gage 1867
Radiation Thermopiles for Use at Liquid-Air Temperatures. C. H. Cartwright 3683
Temperature Classification of the Spectrum of Neodymium. A. S. King...... 4092

5. Accessories for Temperature Measurement and Control.

Determination of the Relationship between Wave-Lengths of Light and the Fundamental Standards of Length. J. E. Sears, Jr., and H. Barrell 79
Modifications in the Haughton-Hanson Thermostat. J. L. Haughton........ 296
Automatic Regulator for Thermostats or Adiabatic Calorimeters. H. Rieche.. 297
Use of Triode as Relay in Temperature Regulation. E. Rosenbohm.......... 654
Modifications of Resistance Thermometer Bridge and of Commutator Selector. Marion Eppley 655
Theory of Temperature Control. M. Lang 2488
Automatic Apparatus Assembly for Thermal Analysis. C. T. Eddy.......... 2489
Apparatus for Recording the Rate of Cooling of a Kata-Thermometer. C. P. Black 2490
Vertical, Vacuum, Split-Tube Graphite-Resistance Furnace. R. D. Evans.... 3684
Molybdenum-Resistance Furnace of New Design. G. Burrows and F. L. Clark 4159
Temperature of Inflammation of Detonating Gas at Atmospheric Pressure. Tauzin 4162
Air Thermostat for Solubility Measurements. H. G. Beier and H. Brintzinger 4583
See also 1124 *under* 3.

6. Unclassified.

Surface Temperatures of Geometrically Simple Bodies. G. Pöschl 286
Optical Determination of Temperature in Discharge Tubes. L. S. Ornstein and P. J. Haringhuizen 328
Measurement of the Temperature of a Coal-Gas Flame by "*a*-Particle Method." A. Shirodkar 1951
Flame Temperatures of Complex Mixtures of Gases and a Method for Calculating Them. B. Lewis, H. Seaman and G. W. Jones 1953
Temperature Measurement in an A.C. Carbon Arc. E. F. Richter.......... 2527
Possibility of Attaining Arbitrarily Low Temperatures. F. Simon.......... 3094
Production of Low Temperature by Compression of Liquid Helium. W. Meissner 3095
Periodic Course of the Gas Temperature in the Column of an A.C. Air Arc Light. A. v. Engel and M. Steenbeck 3134
High-Temperature X-Ray Camera for Precision Measurements. A. H. Jay 4340
Initial Temperature of Grey Radiation in Metals, Oxides and Sulphides. G. Tammann and W. Boehme 4898
Extremely Low Temperatures. W. J. de Haas 4975
Estimation of Tenths on a Scale. H. Bäckström 5162

Terrestrial Electricity and Magnetism.

1. Atmospheric Electricity. Ionosphere. Lightning.
2. Earth's Magnetic Field, and Variations of. Aurora.
3. Earth Currents.
4. Unclassified.

Cross-References:
Cosmic Rays, *see* Radiation, Emission, 5.
Electric Wave Propagation, *see* Radiation, Emission, 4; *also* Section B.—Electrical Engineering.
Magnetism of Rocks, *see* Geophysics, Applied, 1; *also* Land, Physics of the, 3.

1. Atmospheric Electricity. Ionosphere. Lightning.

Potential Gradient and Air-Earth Current. F. J. W. Whipple 159
Polarity of Thunderclouds. E. C. Halliday 160

Terrestrial Electricity and Magnetism, *continued.*

Abstract Nos.

Atmospheric Parasites. F. Link 161
Formation of Local Thunderstorms. Part II. Processes in the Free Atmosphere above Lindenburg on 2nd and 3rd July, 1932. H. v. Ficker 533
Atmospheric Electricity. Return Shock. E. Mathias 541
Eclipse of the Sun of 31st August, 1932, and Sounding by Atmospherics. J. Lugeon 542
Effect of Recent Solar Eclipse on the Ionised Layers of the Upper Atmosphere. J. P. Schafer and W. M. Goodall 543
Photometric Study of Partial Lunar Eclipse of 14th September, 1932. F. Link 923
Brief Review of the Physics of the Upper Atmosphere. J. Bartels 959
Error in Marking an Aitken Pocket Dust Counter. V. F. Hess and C. O'Brolchain 977
Electrical Conductivity and Atmospheric Condensation Nuclei during a Voyage to Greenland. C. Maurain and J. Devaux 984
Measurements of the Ionic Spectrum in Innsbruck. J. Booij 985
Electronic Bombardment as a Factor in Atmospheric Phenomena. W. M. Cohn 986
Ratio of the Number of Uncharged Nuclei to Number of Charged Nuclei of One Sign. C. O'Brolchain 987
Ionisation of the Atmosphere and its Biological Effects. L. R. Koller 1218
Physics in Meteorology. G. C. Simpson 1387
Smoke Particles and Condensation Nuclei at Kew Observatory. H. L. Wright 1391
Aitken Pocket Nuclei-Counter. G. R. Wait 1399
Measurements of the Ionic Spectrum in Leiden. J. Booij and A. J. S. van Leeuwen, Jr. 1400
Comparison of Methods for Counting the Ions in the Atmosphere. H. T. Graziadei 1401
Variations in Potential Gradient Caused by Some Meteorological Phenomena. J. M. Sil 1402
Sources of Errors in the Determination of the Potential Gradient of the Earth's Electric Field. A. G. McNish 1819
Air Earth Current at Kew Observatory. F. J. Scrase 1820
Propagation of a Lightning Discharge through the Atmosphere. E. C. Halliday 1821
Determination of the Constant Ratio between the Final and Initial Volumes in the Progressive Decomposition of Fulminating Matter at Atmospheric Pressure for the Same Initial and Final Temperatures. E. Mathias 1822
Dust Motion in Electric Fields. S. Franck 2288
Phases of the Explosion of Fulminant Matter on Cooling. E. Mathias 2296
Influence of Atmospheric Suspensoids upon the Earth's Electric Field. H. L. Wright 2297
Theory of Lightning. F. Ollendorff 2298
Progressive Lightning; New Stereoscope. C. V. Boys 2299
Numbers of Charged and Uncharged Condensation Nuclei in Town and Mountain Air. P. F. Schachl 2300
Multiply Charged Large Ions. J. J. Nolan and J. G. O'Keeffe 2301
Atmospheric Electricity and Föhn Sickness. W. S. van Leeuwen, J. Booij and J. van Niekerk 2909
Relations between the Combination Coefficients of Atmospheric Ions. F. J. W. Whipple 2910
Influence of Solar Activity on the Earth's Atmosphere. B. Düll 3423
Aerial-Earth Current. H. Noto 3453, 4430, 4836
Influence of Condensation Nuclei and Dust Particles on Atmospheric Ionisation. P. J. Nolan 3454
Electrical Conductivity of the Air by a Null Method. (Miss) O. Thellier...... 3455
Time of Establishment of Lightning. H. Jehle 3456
Electric Potential Gradient and Atmospheric Pressure. R. Guizonnier 4020
Fluctuations of the Earth's Electric Field. A. Dupérier and G. Collado 4431
Variations in the Small-Ion Content of the Atmosphere and their Causes. G. R. Wait 4432
Correction of Previous Results on Nucleus Counting and Ionic Charge. H. Israël 4831
Life of Ions in Free Air. J. Scholz 4832
Rôle of Space-Charge in Atmospheric Electricity. J. G. Brown 4833
Possible Stellar Origin of High-Speed Ions. R. Gunn 4834
Effects of Turbulent Air-Flow in Apparatus for Atmospheric-Electric Measurements. O. H. Gish 4835
Electric Charge Collected by Water Drops falling through Ionised Air in a Vertical Electric Field. J. P. Gott 4837

For the **Key** to this Index see pp. 1358 to 1372.

Terrestrial Electricity and Magnetism, *continued.*

Abstract Nos.
Ball Lightning. J. C. Jensen 5237
See also 166, 546, 1405, 1825, 2305, 4434, 5238 *under* 2; 5240 *under* 3.

2. Earth's Magnetic Field, and Variations of. Aurora.

Secular Variation of Earth's Magnetism. A. Schmidt 162
Secular Change of Earth's Magnetism. D. L. Hazard 163
Unsymmetrical Distribution of Secular Variation. H. W. Fisk 164
Variations of Earth's Magnetic Elements near Poles. B. P. Weinberg 165
Field Energy of Magnetic Storms. S. Chapman 166
Sudden Changes in the Earth's Magnetic Field. L. Rodés 167
Terrestrial Magnetism. A. Nippoldt 168
Magnetic Potential at the Geographic Pole. L. Steiner 169
Auroral Curtains and the Corpuscular Theory. C. Störmer 170
Electron Orbit in the Magnetic Equatorial Plane of the Earth. W. F. G. Swann 213
Consequences of the Classical Deviation Theory. H. Meldau 544
Distribution of Mass in Marine Compasses. W. J. Peters 545
Explanation of Echoes in Space, Auroræ and Magnetic Storms. Part I. H. Dostal 546
Formulæ of Vening Meinesz and Callandreau and Other Formulæ of Higher Geodesy. N. Malkin 954
Investigations of the Auroral Spectrum during 1921-1926. L. Vegard 970
Relation between Diurnal Variations of Earth Current and Terrestrial Magnetic Field. D. Stenquist 1403
Earth's Magnetisation in Ancient Times. J. Koenigsberger 1404
Terrestrial Magnetic Variations of Short Duration. A. H. R. Goldie 1405
Audibility of the Aurora and its Appearance at Low Atmospheric Levels. C. S. Beals 1406
Height of the Aurora and Temperature of the Upper Atmosphere. G. Angenheister 1812
Magnetic Map of Italy. L. Palazzo 1823
Magnetic Observations at Mogadiscio. M. Bossolasco 1824
Summary of the Year's Work, Department of Terrestrial Magnetism, Carnegie Institution of Washington. J. A. Fleming 1825
Progress in the Photography of the Aurora Borealis. C. Störmer 1826
Value of the Spherical Function and its Derivation for the Most Important Terrestrial Magnetic Observatories. G. Fanselau 1827
Review of the Physics of the Upper Atmosphere. J. Bartels 2286
Terrestrial Magnetic Elements and Structure of the Earth's Crust in Japan. T. Terada 2302
Apparatus for Measurement of the Earth's Magnetic Field. L. F. Bates 2303
Most Important Results of Auroral Investigation. C. Störmer 2304
Kinematographic Results of Measurements of Height and Proof of Infra-Red Radiation of the Aurora. W. Bauer 2305
Gravitation and Earth's Magnetism. T. Schlomka 2911
Magnetic Declination over the Globe. (Miss) G. Homery and C. Maurain 2912
Time-Interval between Solar Phenomena and Terrestrial Magnetic Disturbances. C. Maurain 2913
Variation of the Horizontal Component around Days of Magnetic Calm. L. Éblé 2914
Low Auroræ. G. C. Simpson 2915
Action of the Earth's Magnetic Field on Penetrating Radiation. E. Fermi and B. Rossi 2984
New Theory of Magnetic Storms. S. Chapman and V. C. A. Ferraro 4021
Total Intensity of the Earth's Magnetisation from the Time of Revolution of Slower Electrons. K. H. Stehberger 4022
Approximate Integration of the Equations of Motion of Electrons in the Field of a Magnetic Dipole. C. Störmer 4023
Application of Liouville's Theorem to Electron Orbits in the Earth's Magnetic Field. W. F. G. Swann 4024
Diurnal Incidence of Disturbance in the Terrestrial Magnetic Field. A. C. Mitchell 4025
Explanation of Phenomena Analogous to Beats in Rapid Periodic Variations of Terrestrial Magnetism. M. Nakano 4433
Effect of a Solar Eclipse on the Earth's Magnetic Field. S. Chapman 4434
Regularities in the Succession of Solar Phenomena. H. Deslandres 4807

Terrestrial Electricity and Magnetism, *continued*.

Abstract Nos.

Norwegian Arctic Expedition in the Gjøa 1903-1906 under the Conduct of Roald Amundsen. Part II. Terrestrial Magnetism. A. S. Steen, N. Russeltvedt and K. F. Wasserfall 4838

Relation between Magnetic Activity and the Absolute Values of the Horizontal Component. L. Éblé 4839

Continuous Photoelectric Registration of Polar Auroræ. A. Dauvillier 5231

Auroral Spectrograph and the Upper Atmosphere. L. Vegard 5232

Terrestrial Reactions to Variations of Solar Activity. A. Nodon 5238

Classification of Magnetic Disturbances. (Mme) Y. Labrouste 5239

See also 959, 986, 1387, 4834 *under* 1; 5240 *under* 3.

3. Earth Currents.

Theory of Earth Currents. D. Stenquist 3457

Registration of Earth Currents with Neutral Electrodes. S. K. Banerji...... 5240

See also 1403, 1405, 1825, 5238 *under* 2.

4. Unclassified.

Space Charge in Relation to the Chemical Constituents of the Atmosphere. R. Stoppel 547

Geophysical Station at Mogadiscio. M. Bossolasco 978

Motion of Electrons in Heterogeneous Magnetic Fields. H. Ertel.......... 2542

Paths of Electrons in Axially Symmetric Electric and Magnetic Fields. C. Störmer 2543

Principles of Construction of Magnetic Compasses. M. Tenani.......... 3843

Magnetic Properties of Igneous Rocks. A. F. Hallimond and E. F. Herroun.. 4001

Thermionics.

1. Theory.
2. Measurement of Work Function and Other Emission Constants.
3. Effect of Surface Layers.
4. Effect of Intense Fields (Auto-Electronic Effect).
5. Emission of Positive Ions.
6. Conduction in Flames.
7. Unclassified.

Cross-References:
Valves, Uses of, *see* Oscillations, Electric.

1. Theory.

Problems of Electric Images in Dielectrics. Part I. J. J. Weigle.......... 354

Electron Theory of Metals. R. Peierls 717

Theory of Electronic Semi-Conductors and their Possible Properties. R. H. Fowler 3760

Test of the Classical "Momentnm Transfer" Theory of Accomodation Coefficients of Ions at Kathodes. K. T. Compton and E. S. Lamar.......... 4703

Thermionic Effect and Laws. B. Rossi 5488

See also 3864 *under* 3.

2. Measurement of Work Function and Other Emission Constants.

Exit Work of Electrons from Metals. I. Tamm and D. Blochinzev 411

Thermionic and Photoelectric Work Functions of Molybdenum. L. A. Du Bridge and W. W. Roehr 412

P.D. Between Incandescent Tungsten Electrodes at Different Temperatures. F. Kuhn 1240

Emission of Grids in Triodes. M. Pinna 1241

Slanting Emission of Electrons from Incandescent Metal Surfaces. H. Seemann 1242

Determination of Work of Emission from Oxide Kathodes. W. Heinze.......... 2089

Space Distribution of the Emission from the Glowing Kathode. F. Hamacher 2090

Effect on Electron Paths of the Heating Current Field of Glowing Kathodes. F. Hamacher 2091

Diffusion of Thorium in Tungsten. G. R. Fonda, A. H. Young and Amy Walker 2092

Physical Properties of Compounds of High Melting Point. K. Becker...... 2482

Variation of Secondary Emission with Heat Treatment. P. L. Copeland.... 3268

Secondary Emission of Electrons from Molybdenum. P. L. Copeland........ 3269

Work Function and Distance between Atoms. W. Distler and G. Mönch.... 4704

Thermionics, *continued.*

Abstract Nos.
New Method for Determining the Thermionic Work Functions of Metals and its Application to Nickel. G. W. Fox and R. M. Bowie 4705
Effect of Temperature on Field Currents from Tungsten and Molybdenum. A. J. Ahearn 4706
Evaporation of Atoms, Ions and Electrons from Cæsium Films on Tungsten. J. B. Taylor and I. Langmuir 5093
Work Function and Photoelectric Properties of Metals. P. I. Lukirsky 5489
Surface Ionisation of Potassium on Molybdenum. R. C. Evans 5491
See also 4703 *under* 1; 413, 811, 2093 *under* 5.

3. Effect of Surface Layers.

Emission Distribution at Glow Kathodes with the Magnetic Electron Microscope. M. Knoll, F. G. Houtermans and W. Schulze 336
Liberation of Electrons from a Metal under Bombardment by Slow Positive Ions. G. Valle 695
Kinematography of Oxide Kathodes Using the Electron Microscope. E. Brüche and H. Johannson 806
New Investigations of Kathodes with the Electron Microscope. E. Brüche and H. Johannson 807
Disintegration of Thoriated Tungsten by Recoiling Positive Ions. A. Gehrts.. 3864
Absorption of Thorium upon Tungsten. W. H. Brattain and J. A. Becker.... 3865
Emission from Oxide-Coated Kathodes. Parts I and II. M. Benjamin and H. P. Rooksby 4293
Action of Mercury Metastable Atoms on a Tungsten Surface. S. Sonkin....... 4294
Thermionic and Photoelectric Emission of Cæsium-Cæsium Oxide Kathodes as Influenced by Incorporation of Cæsium Atoms in the Dielectric. J. H. de Boer and M. C. Teves 4295
Electron-Microscopic Observations on the Barium Vapour-Deposited Kathode. E. Brüche and H. Johannson 4296
Thermionic and Photoelectric Emission of Cæsium-Cæsium Oxide Kathodes as Influenced by Incorporation of Cæsium Atoms in the Dielectric. P. Görlich 5490
See also 3268, 5093, 5489 *under* 2.

4. Effect of Intense Fields (Auto-Electronic Effect).

See also 717 *under* 1.

5. Emission of Positive Ions.

Emission from Hot Tungsten. P. B. Moon 413
Diffusion of Positive Ions through Hot Copper. J. Cichocki 808
Emission of Positive Ions from Heated Metals. LeR. L. Barnes 809
Temperature Variation of the Positive Ion Emission from Molybdenum. LeR. L. Barnes 810
Effect of Ammonia on Positive Ion Emissivity of Iron, Nickel and Platinum. A. K. Brewer 811
Equilibrium of Atoms and Ions Adsorbed on a Metal Surface. R. C. Evans.... 1246
Positive Ion Work Function of Tungsten for Alkali Metals. R. C. Evans...... 2093
Emission of Metallic Ions from Oxide Surfaces. Part I. Identification of Ions by Mobility Measurement. L. Brata 4297
Emission of Metallic Ions from Oxide Surfaces. Part II. Mechanism of Emission. C. F. Powell and L. Brata........ 4298
Limitation in Currents of Positive Alkali Ions of Homogeneous Velocities. P. Keck and L. B. Loeb........ 4707
See also 4703 *under* 1; 3864 *under* 3.

6. Conduction in Flames.

Transport of Ions by the Explosion-Wave. A. E. Malinowski and K. T. Tkatschenko 3688

7. Unclassified.

Vacuum Fats. W. Espe and I. Kroczek 414
Heat of Evaporation of Electrons. T. Franzini 3270

Thermochemistry.

1. Heats of Solution and Dilution.
2. Heat of Combustion.
3. Heats of Formation and Dissociation.
4. Flames, Ignition, Explosion.
5. Effect of Temperature on Chemical Processes and Equilibria.
6. Apparatus and Technique.
7. Unclassified.

Cross-References :
Conduction in Flames, *see* Thermionics, 6.
Heat of Adsorption, *see* Adsorption, 2.
Thermodynamics of Chemical Processes, *see* Thermodynamics, 6.

1. Heats of Solution and Dilution.

Abstract Nos.
Heats of Dilution of Solutions of Strong Electrolytes, and the Association Hypothesis of Nernst. E. Plake 656
Standard Potential and Heat of Dissolution of Gallium. E. S. v. Bergkampf.. 752
Heats of Solution of Water Vapour. R. P. Bell.......... 1125
Activity Coefficients of Potassium Chloride. H. M. Spencer.......... 1182
Heats of Solution of Gases. J. Horiuti.......... 1349
Heat Capacity, Heat of Sublimation and Heat of Solution of Phosphorus Pentoxide. M. Frandsen 1533
Thermodynamics of Mixtures with Application to Ethyl-Alcohol. V. Fischer 1959
Heat Capacity and Related Thermodynamic Properties of Aqueous Solutions. Part II. Lithium and Sodium Hydroxides. E. T. Gucker, Jr., and K. H. Schminke 2467
Heat Dilution and Heat Capacity of Zinc Sulphate from the E.M.F. of Galvanic Cells. V. K. La Mer and I. A. Cowperthwaite.......... 2491
Heat Capacity and Entropy of Calcium Oxalate from 19° to 300° Abs. Entropy and Free Energy of Oxalate Ion. W. M. Latimer, P. W. Schutz and J. F. G. Hicks, Jr.......... 2500
Thermodynamic Studies on Potassium and Sodium Sulphates. F. L. E. Shibata, S. Oda and S. Furukawa 3705
Theory of Water and Ionic Solution, with Particular Reference to $\dot{H}$ and OH' Ions. J. D. Bernal and R. H. Fowler 3951
See also 668 *under* 3.

2. Heat of Combustion.

Absorption Spectra of Saturated Halides. S. C. Deb.......... 630
Some Physical-Chemical Constants of Dioxan. W. A. Roth and Ingrid Meyer 1541
Temperature Coefficient of the Recombination Rate of Atomic Hydrogen. I. Amdur 1952
Energy Values of Valency Bonds in Organic Compounds. J. A. Clopatt...... 2492
Thermochemical Constants of the Hexafluorides of Sulphur, Selenium and Tellurium. D. M. Yost and W. H. Claussen.......... 2493
Standard States for Bomb Calorimetry. E. W. Washburn.......... 3074
Heat of Combustion of Cyanogen. H. v. Wartenberg and H. Schütza........ 3096
Heat of Combustion, Free Energy and Entropy of Cyanogen Gas. J. McMorris and R. M. Badger 3097
Latent Heats of Binary Mixtures. V. Fischer.......... 3664
Heats of Combustion of CO in O_2 and of N_2O in CO at Constant Pressure. J. H. Awbery and E. Griffiths.......... 4160
Heats of Formation of N_2O and CO_2. R. W. Fenning and F. T. Cotton.......... 4161
Temperature Distribution of a Gas Flowing Through a Furnace. K. F. Herzfeld 4964
See also 752, 3705 *under* 1 ; 657, 3109 *under* 3 ; 1534 *under* 6.

3. Heats of Formation and Dissociation.

Photo-Bromination of Benzene. E. Rabinowitsch 189
Near Ultra-Violet Bands of Silicon Tetrachloride. A. C. Datta.......... 240
Spectrum of Potassium Hydride. G. M. Almy and C. D. Hause.......... 241
Heat of Formation of Hydrochloric Acid. H. v. Wartenberg and K. Hanisch.. 298
Specific Heat and Heat of Dissociation of Gases at High Temperatures. K. Wohl and M. Magat 300
Absorption Spectrum of Nitrous Oxide and Heat of Dissociation of Nitrogen. A. K. Dutta 301
Dissociation-Heat of Lead Lattice. G. v. Hevesy, W. Seith and A. Keil 441
Band Spectrum of Chromium Oxide. C. Gosh 607
CH Band 3143 Å. T. Heimer 619
Absorption Spectrum of Iodine Bromide. W. G. Brown.......... 622

Thermochemistry, *continued.*

Abstract Nos.
Absorption Spectra of Some Alkali Fluorides and Heat of Dissociation of Fluorine. M. S. Desai 631
Association in Gases under the Effect of Electric Fields. H. Senftleben 644
Internal Energy of Gases after Explosion. W. T. David, J. R. Brown and A. H. El Din 657
Heats and Nature of Combination of Organic Molecular Compounds. G. Briegleb and T. Schachowskoy 658
Studies in Coordination. Part IV. Some Fluorides and Chlorides and their Complex Ions. F. J. Garrick 659
Free Energy, Entropy and Heat of Formation of Iron Carbide (Fe$_3$C). Yap, Chu-Phay and C. L. Liu 667
Heat of Formation of Hydrogen Chloride and Related Thermodynamic Data. F. D. Rossini 668
Band Spectrum, Predissociation and Structure of the P$_2$ Molecule. G. Herzberg 1050
Free Energies of Formation of Various Forms of Lead Monoxide. H. M. Spencer and J. H. Mote 1133
Dissociation of Oxygen to 5000° K. Free Energy of Atomic Oxygen. H. L. Johnston and Margery K. Walker 1555
Arc Spectrum of Iodine. S. C. Deb 1880
Absorption Spectra of Higher Oxides. A. K. Dutta and P. K. Sen Gupta 1887
Continuous Absorption Spectra of Polyatomic Molecules. Y. Hukumoto 1904
Quantum Mechanics of Beryllium Hydride. C. E. Ireland 2430
Band Spectrum of Potassium Hydride. T. Hori 3023
Continuous Absorption Spectrum of Polyatomic Molecules. Y. Hukumoto .. 3035
Vapour Pressure, Free Energy and Dissociation of Iodine Cyanide. D. M. Yost and W. E. Stone 3109
Kinetics of the Carbon Dioxide-Carbonic Acid Reaction. R. Brinkman, R. Margaria and F. J. W. Roughton 3685
Heat of Dissociation of the Cadmium Molecule by Thermo-Optical Methods. H. Kuhn and S. Arrhenius 3686
Heat of Dissociation of the Carbon-Carbon Linkage. J. B. Conant 3687
Thermodynamic Data for Metallic Sulphates. Parts I and II. F. Ishikawa and T. Murooka 3704
Infra-Red Spectrum of Carbon Dioxide. A. Adel and D. M. Dennison .. 3027, 4102
Formation of Metallic Hydrides by Atomic Hydrogen. E. Pietsch 4204
Dissociation of Diatomic Molecules with p-p-Bindings. H. Lessheim and R. Samuel 4928
Entropy, Free Energy and Heat of Formation of Lithium Hydroxide and Lithium Chloride. Y. Ueda 4981
Free Energy, Entropy and Heat Capacity of Bromine and of Hydrogen Bromide from Spectroscopic Data. A. R. Gordon and C. Barnes 4982
Heats of Dissociation of Hydrogen and Nitrogen. W. W. Lozier 5370
See also 247 *under* 5.

4. Flames, Ignition, Explosion.

Mechanism of the Initiation and Propagation of Detonation in Solid Explosives. W. Taylor and A. Weale 299
Ignition of Vapours by Electric Sparks. A. Kling and A. Soulier 712
Mechanism of Flame Movement. Part II. H. F. Coward and F. J. Hartwell Part III. H. F. Coward and E. H. M. Georgeson 1126, 3100
Propagation of Flame in Electric Fields. Part II. Effects of Transverse Fields. E. M. Guenault and R. V. Wheeler 1127
Vibratory Movement in Flames. O. C. de C. Ellis and E. Morgan 1128
Propagation Tests and Photography of the Disturbance Emitted by the Explosion of Commercial Electric Detonators. D. B. Gawthrop 1129
Radiation in Gaseous Explosions. W. T. David and R. M. Parkinson 1463
Explosions of Hydrogen-Air and Carbonic Oxide-Air Mixtures at Initial Pressures up to 1000 Atmospheres. W. A. Bone, D. M. Newitt and D. T. A. Townend 1543
Formation of Nitric Oxide in Carbonic Oxide-Oxygen-Nitrogen Explosions. D. T. A. Townend and L. E. Outridge 1544
Nitric Oxide Formation in Continuous High-Pressure Flames of Carbonic Oxide in Oxygen-Nitrogen Atmospheres. D. M. Newitt and F. G. Lamont 1545
Critical Ignition of Explosive Hydrogen Mixtures. J. H. Maas and C. Ewing 1546
Rates of Detonation in Carbon Monoxide-Oxygen Mixtures. C. Campbell, C. Whitworth and D. W. Woodhead 1547

Thermochemistry, *continued.*

Abstract Nos.

Influence of Ionisation upon the Ignition Temperature of a Gas Mixture. B. Lewis and C. D. Kreutz 1548
Infra-Red Absorption Spectra of Organic Compounds and Constituents of Motor Spirits. C. F. Kettering and W. W. Sleator 1898
Measurement of the Temperature of a Coal-Gas Flame by "α-Particle Method." A. Shirodkar 1951
Flame Temperatures of Complex Mixtures of Gases and a Method for Calculating Them. B. Lewis, H. Seaman and G. W. Jones 1953
Ignition of Explosive Gaseous Mixtures by Small Flames. J. M. Holm 1954
Experiment on the Combustion of an Inflammable Gas Mixture by a Hot Wire. J. D. Morgan 1955
Recording of Pressure and Time in Gas Explosions. B. Lewis and G. v. Elbe 1956
Air Waves from Experimental Explosions. F. J. W. Whipple 1976
Effect of an Electric Field on the Flame Temperature of Combustible Gas Mixtures. B. Lewis and C. D. Kreutz 2494
Explosive Properties of Acetone-Air Mixtures. G. W. Jones, E. S. Harris and W. E. Miller 2495
Spectroscopic Events in the Exposition Zones of Methane and Other Hydrocarbons. F. J. Lauer 3030
Photographic Analysis of Explosion Flames. W. A. Bone 3098
Flame Temperatures of Combustible Gas-Oxygen Mixtures. H. H. Lurie and G. W. Sherman 3099
Ignition Temperatures of Mixtures of Ammonia and Air. P. Laffitte and H. Picard 3101
Transport of Ions by the Explosion-Wave. A. E. Malinowski and K. T. Tkatschenko 3688
Burning of an Acetylene-Air Mixture in a Magnetic Field. A. E. Malinowski, W. S. Rossichin and B. I. Naugolnikow 3689
Mechanism of the Inflammation of Electrolytic Gas. N. Semenoff, A. Nalbandjan and F. Dobowizky 3690
Spontaneous Ignition Temperatures of Mixtures of Hydrogen and Air as a Function of the Rate of Heating. M. Prettre 3691
Temperatures of Inflammation of Detonating Gas at Atmospheric Pressure. Tauzin 4162
Experiments on Flame Movements in Gaseous Mixtures. C. Campbell, C. Whitworth and A. King 4163
Upper Pressure Limit in the Chain Reaction between Hydrogen and Oxygen. G. H. Grant and C. N. Hinshelwood 4164
Influence of Pressure on Spontaneous Ignition of Inflammable Gas-Air Mixtures. Part I. Butane-Air Mixtures. D. T. A. Townend and M. R. Mandlekar 4165
Elementary Provinces in Highly-Rarefied Flames. V. Kondratjew 4463
Theory of Detonation. K. K. Andreew 4584
Flame Phenomena of Carbon Monoxide. A. R. J. P. Ubbelohde 4585
Explosions of Methane and Air: Propagation through a Restricted Tube. H. Robinson and R. V. Wheeler 4976
Ignition of Gases. Part VIII. Ignition by a Heated Surface. C. A. Naylor and R. V. Wheeler 4977
Spark Ignition of Low Inflammable Gas Mixtures. Part II. Spectrographic Examination of the Ignition Spark. K. Yumoto 4978
Kinetics of H_2-O_2 Low Pressure Explosions. A. A. Frost and H. N. Alyea 4979
Effect of Change of Composition on the Ignition Region of Methane-Oxygen Mixtures. M. B. Neumann and A. I. Serbinov 5371

5. Effect of Temperature on Chemical Processes and Equilibria.

Products of Dissociation in Nitrogen. J. Kaplan 247
Thermal Decomposition of Methane by a Carbon Filament. H. H. Storch 660
Free Energy of Transition Iron $(\alpha \rightleftarrows \gamma)$. Yap and Chu-Phay 666
Energy Transfer between Complex Gas Molecules and Solid Surfaces. E. W. R. Steacie and H. A. Reeve 1542
Thermal Decomposition of Ethyl Mercaptan and Ethyl Sulphide. N. R. Trenner and H. A. Taylor 1549
Thermal Equilibrium between Oxygen Molecules and Atoms. G. v. Elbe and B. Lewis 1961
Value of the Determination of Free Energy Change for Organic Reactions. D. B. Keyes 1964

Thermochemistry, *continued.*

Abstract Nos.

Thermal Decomposition of Ethyl Mercaptan and Ethyl Sulphide. W. M. Malisoff and E. M. Marks 3102
Transformation of *o*- into *p*-Hydrogen in the Solid Condition. E. Cremer and M. Polanyi 3692
See also 3685 *under* 3; 3691 *under* 4.

6. Apparatus and Technique.

Isothermal Calorimeter for Slow Reactions. E. D. Coon and F. Daniels 1534
See also 1125 *under* 1; 3096, 4161 *under* 2; 3685, 3686 *under* 3.

7. Unclassified.

Energy Exchange in Unimolecular Reactions. O. K. Rice 1130
Effect of Gaseous Impurities on the Radiochemical Combination of Carbon Monoxide and Oxygen. C. Rosenblum 1410
Application of Quantum Mechanics to Chemical Kinetics. R. P. Bell 1957
Quantum Mechanics and Chemistry with Particular Reference to Reactions Involving Conjugate Double Bonds. H. Eyring 1958
Investigation of the Glow of Phosphorus with the Aid of a Photoelectric Counter. C. Ouellet 2357
Physical Properties of Ethylamine. E. Pohland and W. Mehl 2466
Lifetimes of Unstable Molecules. N. Rosen 3022
Nature of the Chemical Bond. Part V. Quantum-Mechanical Calculation of the Resonance Energy of Benzene and Naphthalene and the Hydrocarbon Free Radicals. L. Pauling and G. W. Wheland Part VI. Calculation from Thermochemical Data of the Energy of Resonance of Molecules Among Several Electronic Structures. L. Pauling and J. Sherman. Part VII. Calculation of Resonance Energy in Conjugated Systems. L. Pauling and J. Sherman 3288, 3878, 4720
Activation Energies for Reactions of Atoms in Different States. G. K. Rollefson and J. C. Potts 3693
Quantum Mechanics of Chemical Reactions Involving Conjugate Double Bonds. H. Eyring, A. Sherman and G. E. Kimball 4166
Chemical Potential of Salt Solutions. R. E. Gibson and L. H. Adams 4595
Output of Heat and Temperature Distribution of Electrically Heated Wires. A. Farkas and H. H. Rowley 4966

Thermodynamics.

1. Fundamental Principles (1st and 2nd Laws). Determination of Mechanical Equivalent of Heat.
2. Equations of State and Critical Phenomena.
3. Application to Specific Heats and Latent Heats.
4. Phase Rule and Applications.
5. Measurements of and Formulæ for Entropy, Internal Energy, Total Heat (Enthalpy), Free Energy (Thermodynamic Potential at Constant Volume and Temperature), Gibbs' Function (Phase Potential, Thermodynamic Potential at Constant Pressure and Temperature), etc.
6. Thermodynamics of Chemical Processes.
7. Irreversible Phenomena.
8. Unclassified.

Cross-References:
Absolute Scale of Temperature, *see* Temperature, Measurement of, 1.
Kinetic Theory, *see* Kinetic Theory of Matter.
V.P.T. Relations, Experimental, *see* Elasticity and Plasticity, 2.

1. Fundamental Principles (1st and 2nd Laws). Determination of Mechanical Equivalent of Heat.

Interpretation of Heat Relativistic Thermodynamics. R. C. Tolman and H. P. Robertson 2497
Thermodynamical Fluctuations. M. v. Laue 3103
Planck's Proof of the Second Law of Thermodynamics. M. Sugita 3694
Multiple Entropy and the Two Fundamental Laws of Thermodynamics. A. Press 3695
Thermodynamic Principle Governing Stationary States. B. Bružs 4586
Second Law of Thermodynamics and the Relations between Parts of the World-System. M. Bronstein and L. Landau 4587
Energy of β-Rays and Law of Conservation of Energy. M. Hayakawa 4844

2. Equations of State and Critical Phenomena.

Density Curves and Rectilinear Diameter of Carbon Monoxide. E. Mathias, C. A. Crommelin, W. J. Bijleveld and P. P. Grigg 42

Thermodynamics, *continued.*

Abstract Nos.

Fusion Curve of Hydrogen up to 610 kg./cm.^{2} W. H. Keesom and J. H. C. Lisman 289
Equation of the Melting Curve. J. J. van Laar 290
Friction, Thermal Conductivity and Diffusion in Gaseous Mixtures. Parts XXI, XXII and XXIII. M. Trautz 643, 3079, 3080
Fusion under Pressure. E. Jänecke 651
Density of Ammonia at Reduced Pressures and Its Relation to the Atomic Weight of Nitrogen, the Gas Constant R, and the Limiting Molal Volume V_0. G. Dietrichson, C. W. Orleman and C. Rubin 1305
Empirical Equation of State. H. S. Frank and F. S. Lei 1550
Physico-Chemical Factors in High-Pressure Design. B. F. Dodge 1551
Heat of Expansion of a Gas of Varying Mass. L. J. Gillespie and J. R. Coe, Jr. 1552
Thermodynamics of Mixtures with Application to Ethyl-Alcohol. V. Fischer 1959
Heat Diagram for Benzene, C_6H_6. H. Mehlig 1960
Transport Phenomena in Einstein-Bose and Fermi-Dirac Gases. Part I. E. A. Uehling and G. E. Uhlenbeck 2496
Possibility of Attaining Arbitrarily Low Temperatures. F. Simon 3094
Production of Low Temperature by Compression of Liquid Helium. W. Meissner 3095
Joule-Thomson Effect and Heat Capacity at Constant Pressure for Ammonia. Kou-Cheng Su and Tzu-Ching Huang 3104
Isothermals of Hydrogen. A. Michels and A. J. J. Gerver 3105
Equation of State for Monomolecular Films. J. Guastalla 3379, 4588
Equation of State of Real Fluid. S. C. Bradford 3696
Calculation of the Second Virial Coefficient of Gases. T. S. Wheeler 3697
Empirical Equation of State for Gases. G. A. Linhart 3698
Thermodynamic Properties of Real Gases as Explicit Functions of the Pressure and Temperature. T. C. Huang and K. C. Su 3699
Nature of the Critical States at the Transition Liquid-Gas. W. Ostwald 3700
Solvation of Molecules and the Equation of State of the Adsorption Layer. S. E. Bresler, J. B. Chariton, B. A. Talmud and D. L. Talmud 3877
Free Paths and Transport Phenomena in Gases and the Quantum Theory of Collisions. Part I. Rigid Sphere Model. H. S. W. Massey and C. B. O. Mohr 3940
Discontinuity in the Adsorption of Gases, Vapours and Liquids on Solid Surfaces at the Critical Temperature and Pressure. H. E. Morris and O. Maass 4712
Density of a Vapour in Equilibrium with a Liquid near the Critical Temperature. J. S. Tapp, E. W. R. Steacie and O. Maass 4751
Formula for Specific Volumes of Saturated Vapours. C. H. Meyers 5372
Equation of State and Parachor Relation. A. Eucken 5373
See also 3695 *under* 1 ; 99, 4591 *under* 5.

3. Application to Specific Heats and Latent Heats.

Vapour Pressure Constant of Methane. T. E. Sterne 673
Asymptotic Expansions of the Expressions for the Partition Function and the Rotational Specific Heat of a Rigid Polyatomic Molecule for High Temperatures. Irene E. Viney 1553, 4589
Heat Capacity Curves of the Simpler Gases. Part I. Gaseous Nitric Oxide. Part II. Gaseous Oxygen. H. L. Johnston and A. T. Chapman 1554
Dissociation of Oxygen to 5000° K. Free Energy of Atomic Oxygen. H. L. Johnston and Margery K. Walker 1555
Thermal Equilibrium between Oxygen Molecules and Atoms. G. v. Elbe and B. Lewis 1961
Specific Heat of Oxygen at High Temperature from Ozone Explosions and the Energy of the $^1\Delta$ Level of the Neutral Oxygen Molecule. B. Lewis and G. v. Elbe 1962
Molecular Heats and Normal Oscillations of Ethane and Ethylene. A. Eucken and A. Parts 2465
Heat Capacity and Related Thermodynamic Properties of Aqueous Solutions. Part II. Lithium and Sodium Hydroxides. F. T. Gucker, Jr., and K. H. Schminke 2467
Standard States for Bomb Calorimetry. E. W. Washburn 3074

For the **Key** to this Index see pp. 1368 to 1372.

Thermodynamics, *continued.*

Abstract Nos.
Latent Heats of Binary Mixtures. V. Fischer 3664
Empirical Molecular Heat Equations from Spectroscopic Data. W. M. D. Bryant 4124
Specific Heat of the Restricted One-Dimensional Rotator. E. Teller and K. Weigert 4590
Correlation of Heat Capacity, Absolute Temperature and Entropy. G. A. Linhart 5374
Ratio λ_m/σ_m for Crystals and Liquids. R. Kaischew and L. Krastanow 5375
See also 1551, 1959, 3104 *under* 2 ; 4591, 4982, 5377, 5378 *under* 5.

4. Phase Rule and Applications.

Solvent Properties of Soap Solutions. Part III. System Sodium Oleate, Sodium Chloride, Water, Ethyl Acetate. E. L. Smith 110
Thermodynamics of Concentrated Solutions. Part II. Crystallisation Curves in Binary Eutectic Systems. E. Kordes 302
Polyphase Equilibria in Systems which are Separated by Membranes. R. Eisenschitz 661
System Carbon Disulphide-Ethylene Dichloride. D. L. Hammick and J. Howard 1131
Dipole Rotation in Crystalline Solids. C. P. Smyth and C. S. Hitchcock 1173
Extension of the Phase Rule for Adsorption under Equilibrium and Non-Equilibrium Conditions. I. Langmuir 1556
Solid Carbon Dioxide from Flue Gas. F. E. E. Germann 1963
X-Ray Study of Phase Boundaries in Thermal Diagrams of Alloy Systems–Cu-Zn System. E. A. Owen and L. Pickup 2137
Proof of Canonical Distribution within Part of a System. G. Krutkow 2498
Copper-Magnesium Alloys Examined Thermodynamically. F. H. Jeffery 2499
Elongation of Tin Crystals. J. Obinata and E. Schmid 2695
Mean Atomic Volume and Composition in Copper-Zinc Alloys. E. A. Owen and L. Pickup 2702, 2703
Mean Atomic Volume and Composition in Silver-Zinc Alloys. E. A. Owen and L. Pickup 2704
Transition Points of Salt Hydrates in Various Non-Aqueous Solvents. W. W. Lucasse and H. J. Abrahams 3106
Change in the Transformation Temperature of Copper Sulphate at 56° with the Solvent Medium. H. J. Abrahams and W. W. Lucasse 3107
Phase Equilibrium Relationships Determining Glass Compositions. G. W. Morey 4084
Equilibrium Diagram for Ternary System. V. Fischer 4167
Influence of Surface Energy in Disperse Systems. Chu-Phay Yap 4168
Transformation of Solid Ammonium Chloride at about –30° C. A. Smits and C. H. MacGillavry 4970
Theory of Electrocapillarity. Part I. S. R. Craxford, O. Gatty and J. St. L. Philpot 5185
See also 1959 *under* 2 ; 5375 *under* 3 ; 5377, 5378 *under* 5 ; 4986 *under* 6.

5. Measurements of and Formulæ for Entropy, Internal Energy, Total Heat (Enthalpy), Free Energy (Thermodynamic Potential at Constant Volume and Temperature), Gibbs' Function (Phase Potential, Thermodynamic Potential at Constant Pressure and Temperature), etc.

Statistical Mechanics with Particular References to the Vapour Pressures and Entropies of Crystals. R. H. Fowler and T. E. Sterne 99
Calorimetric Method for Determining the Intrinsic Energy of a Gas as a Function of the Pressure. E. W. Washburn 283
Methane Equilibria from Absolute Entropies, with a Note on the Use of the Ehrenfest Symmetry Number. A. R. Gordon and C. Barnes 303
Thermodynamics of Lead Bromide. Jessie Y. Cann and Ruth A. Sumner 304
Thermodynamic Studies on Silver Chloride and Silver Bromide. F. L. E. Shibata and T. Taketa 305
Ionisation of Organic Acids. H. M. Smallwood 368
Thermodynamic Properties of Fused Salt Solutions. E. J. Salstrom 662

Thermodynamics, *continued.*

Abstract Nos.

Thermodynamic Properties of Liquid Solutions of Silver Bromide with Alkali Bromides. J. H. Hildebrand and E. J. Salstrom 663
Heat Capacities, Entropies and Free Energies of Seven Organic Compounds Containing Nitrogen. H. M. Huffman and H. Borsook 664
Exact Thermodynamics of Membrane Equilibria. F. G. Donnan and E. A. Guggenheim 665
Free Energy of Transition of Iron $(\alpha)\rightleftarrows\gamma$. Yap and Chu-Phay 666
Free Energy, Entropy and Heat of Formation of Iron Carbide (Fe_3C). Yap, Chu-Phay and C. L. Liu 667
Heat of Formation of Hydrogen Chloride and Related Thermodynamic Data. F. D. Rossini 668
Origin of Zero-Point Entropy. K. Clusius 669
Electrical Conductivity and Diagram of State of Binary Alloys. Lithium-Cadmium System. G. Grube, H. Vosskühler and H. Vogt 729
Electrolytes in Mixed Solvents. Part IV. Free Energy of Zinc Chloride in Water-Alcohol Solutions. R. T. Hamilton and J. A. V. Butler. Part V. Free Energy of Lithium-Chloride in Water-Alcohol Mixtures and Salting-out of Alcohol. J. A. V. Butler and D. W. Thomson 742, 4242
Mercury Drop Electrode. M. Andauer and E. Lange 750
Calorimetric Determination of the Intrinsic Energy of Gases as a Function of the Pressure. F. D. Rossini and M. Frandsen 1117
Thermodynamic Properties of Solid Solutions of Gold and Silver. A. Wachter 1132
Free Energies of Formation of Various Forms of Lead Monoxide. H. M. Spencer and J. H. Mote 1133
Entropy, Heat Content and Free Energy of Iron. J. B. Austin 1134
Thermodynamic Data on Zinc Chloride and Cadium Chloride. F. Ishikawa, G. Kimura and T. Murooka 1557
Thermodynamic Study of Cadmium Hydroxide. F. Ishikawa and E. Shibata 1558
Thermodynamics of Adsorption at the Surface of Solutions. E. A. Guggenheim and N. K. Adam 1559
Entropy of Polyatomic Molecules and the Symmetry Number. J. E. Mayer, S. Brunauer and Maria G. Mayer 1560
Joule-Thomson Effect in Helium. J. R. Roebuck and H. Osterberg 1561
Heat Capacity and Free Energy of Formation of Ethylene. M. E. Haas 1930
Value of the Determination of Free Energy Change for Organic Reactions. D. B. Keyes 1964
Free Energy of Formation of Iodine Monobromide in Carbon Tetrachloride Solution. D. M. Yost, T. F. Anderson and F. Skoog 1965
Thermodynamic Properties of the H^1H^2, H^2H^2 Molecules and Compounds Containing the H^2 Atom. H. C. Urey and D. Rittenberg 1966
Thermochemical Constants of the Hexafluorides of Sulphur, Selenium and Tellurium. D. M. Yost and W. H. Claussen 2493
Heat Capacity and Entropy of Calcium Oxalate from 19° to 300° Abs. Entropy and Free Energy of Oxalate Ion. W. M. Latimer, P. W. Schutz and J. F. G. Hicks, Jr. 2500
Heat of Combustion, Free Energy and Entropy of Cyanogen Gas. J. McMorris and R. M. Badger 3097
Vapour Pressure, Free Energy and Dissociation of Iodine Cyanide. D. M. Yost and W. E. Stone 3109
Entropy and Free Energy of Activation. V. K. La Mer 3110
Thermodynamic Functions of Hydrocarbon Gases from Spectroscopic Data. L. S. Kassel 3111
Calculation of Thermodynamic Quantities from Spectroscopic Data. A. R. Gordon and C. Barnes 3112
Free Energy of Steam and of Carbon Dioxide. A. R. Gordon 3113
Entropy in Intermediate Phases. A. Ölander 3701
Entropy of a Crystalline Solution of Silver Bromide and Silver Chloride in Relation to the Third Law of Thermodynamics. E. D. Eastman and R. T. Milner 3702
Free Energy of Ozone. L. S. Kassel 3703
Thermodynamic Data for Metallic Sulphates. Parts I and II. F. Ishikawa and T. Murooka 3704
Thermodynamic Studies of Potassium and Sodium Sulphates. F. L. E. Shibata, S. Oda and S. Furukawa 3705
Thermodynamical Study of Systems of Type $PbCl_2 - RCl - H_2O$ at 25° C. A. J. Allmand and L. J. Burrage 3706

For the Key to this Index see pp. 1358 to 1372.

Thermodynamics, *continued.*

Abstract Nos.

Thermodynamics of Aqueous Hydrochloric Acid Solutions from E.M.F. Measurements. H. S. Harned and R. W. Ehlers 3707
Statistical Theory of Low-Frequency Intermolecular Forces. J. G. Kirkwood 3942
Theory of Water and Ionic Solution, with Particular Reference to $\dot{H}$ and OH' Ions. J. D. Bernal and R. H. Fowler 3951
Mathematical Methods for Computing Thermodynamic Functions from Spectroscopic Data. L. S. Kassel 4123
Theory of Heat Conduction. B. Bružs 4149
Thermodynamic Studies of Mercurous Bromide. F. Ishikawa and Y. Ueda .. 4169
Thermodynamic Studies of Cadmium Bromide. F. Ishikawa and Y. Ueda 4170
Heat Capacity Curves of the Simpler Gases. Part III. Heat Capacity, Entropy and Free Energy of Neutral OH. H. L. Johnston and D. H. Dawson 4171
Molecular Heats of Organic Liquids. N. de Kolossowsky and W. W. Udowenko 4569
Thermodynamic Theory of Liquids. N. de Kolossowsky 4591
Elementary Deduction of Gibbs' Absorption Theorem. F. O. Koenig and R. C. Swain 4717
Virial Theorem and Molecular Structure. J. C. Slater 4721
Origin of a Canonical System. L. S. Ornstein and W. R. van Wijk 4980
Entropy, Free Energy and Heat of Formation of Lithium Hydroxide and Lithium Chloride. Y. Ueda 4981
Free Energy, Entropy and Heat Capacity of Bromine and of Hydrogen Bromide from Spectroscopic Data. A. R. Gordon and C. Barnes 4982
Theory of Distribution of Electrolytes Between a Solid Crystalline and a Liquid Phase. A. P. Ratner 5376
Jump in the Expansion Coefficient of Liquid Helium in Passing the λ Point. W. H. Keesom 5377
Phase Changes in the Usual and Wider Senses Classified according to the Corresponding Singularities of the Thermodynamic Potential. P. Ehrenfest 5378
See also 3695, 4586 *under* 1; 1552, 1960, 3699 *under* 2; 1554, 1961, 5374 *under* 3; 1626 *under* 6; 1967, 3108, 3115 *under* 7.

6. Thermodynamics of Chemical Processes.

Overstepping of Potential Thresholds in Chemical Reactions. E. Wigner 306
Studies in Coordination. Part IV. Some Fluorides and Chlorides and their Complex Ions. F. J. Garrick 659
Determination of the Mass of Electrolytic Ions. P. Debye 1626
Combustion Problem of Internal Ballistics. A. D. Crow and W. E. Grimshaw 2501
Thermodynamic Properties of Fused Salt Solutions. Part VII. Zinc Bromide in Lead Bromide. E. J. Salstrom 2502
Photosynthesis of Hydrogen Chloride. Part I. New Experimental Method; Inhibiting Effect of Hydrogen Chloride. Part II. Oxygen-Free Mixtures. M. Ritchie and R. G. W. Norrish 2961
Combustion Problems of Internal Ballistics. A. D. Crow and W. E. Grimshaw 3114
Van't Hoff's Equation for Chemical Equilibrium and the Equation of the Isochore of Reaction. E. Denina 3708
Thermodynamics and the Kinetics of Gaseous Reactions. W. H. Rodebush .. 3709
Thermodynamics of Very Rarefied Gases and Solutions. W. Nernst 4172
Ionic Activity at Extemely High Concentrations. F. Tödt 4243
Changes in "Solid" Gases. K. Clusius 4592
General Formula for Chemical Reactions Covering all Statistics Yet Known. S. Suzuki 4593
Kinetics of $H_2 - O_2$ Low Pressure Explosions. A. A. Frost and H. N. Alyea 4979
Molecular Theory of Gases. Part I. M. Trautz 4983
Complex Formation due to Polarisation. Part I. System Kr — HCl. Part II. System C_3H_8 — HCl. G. Glockler, C. P. Roe and D. L. Fuller 4984, 4985
Binary Systems in Two Phases. Part I. HCl — Kr. Part II. HCl — C_3H_8. G. Glocker, D. L. Fuller and C. P. Roe 4986
Heats of Dissociation of Hydrogen and Nitrogen. W. W. Lozier 5370
Para- and Ortho-Hydrogen. L. Farkas 5379
See also 1555, 1961 *under* 3; 661 *under* 4; 303, 304, 305, 662, 668, 1133, 1557, 1558, 1964, 1966, 3109, 3110, 3111, 3112, 3113, 3704, 3705, 3706, 3707, 4149, 4981, 4982 *under* 5.

Thermodynamics, *continued.*

7. Irreversible Phenomena.

Abstract Nos.
Thermodynamics of Irreversible Processes. M. Sugita 1967, 3108
Thermodynamics and Relativity. R. C. Tolman 3115
See also 4586, 4587 *under* 1; 3700 *under* 2; 3110 *under* 5; 4983 *under* 6.

8. Unclassified.

Theory of Diffusion. E. Bružs 44
Rapid Derivation of Thermodynamical Relations. A. N. Shaw 1562
Cooperative Phenomena. F. Zwicky 1700
Statistics of Continuous Systems and Temporal Course of Physical Processes. M. Leontowitsch 2214
Quantum-Mechanical Stability of Benzene Molecule. M. Markov 5107

Thermoelectricity.

1. Theory.
2. Measurement of Thermoelectric Power, Peltier Coefficient, Thomson Coefficient.
3. Unclassified.

Cross-References:
Thermoelectric Measurement of Temperature, *see* Temperature, Measurement of, 3.

1. Theory.

Theory of Thermoelectricity. B. Bružs 415
Electron Theory of Metals. R. Peierls 717
Theory of Thermoelectric Effects at Low Temperatures. W. Kroll 2095
Inverse Joule Effect. C. Benedicks and G. Siljeholm 2096
Theory of Electronic Semi-Conductors and their Possible Properties. R. H. Fowler 3760
Thermotension between Half Conductor and Metal. G. Mönch 3868
Theory of Heat Conduction. B. Bružs 4149
Theory of Regular Mixed Phases. Part III. C. Wagner 4211
Theory of Thermoelements Composed of Semi-Conductors. C. Wagner 4212
Theory of the Anomalous Magnetic and Thermoelectric Effects in Metals. D. Blochinzev and L. Nordheim 4667
See also 416, 4213, 4214 *under* 2.

2. Measurement of Thermoelectric Power, Peltier Coefficient, Thomson Coefficient.

Thomson Effect in Crystalline Substances. Y. Endô 416
Thermoelectric Power of Multiple Oxides. F. Fischer, K. Dehn and H. Sustmann 812
Peltier Effect in Accurate Temperature Measurements. M. Lang 1244
Electrical Phenomena in Lead Glance Crystals Caused by Light, Heat and Kathode Rays. E. Rupp 2081
Change of the Thermo-E.M.F. on the Recuperation of Metals from Mechanical Treatment when Cold. G. Tammann and G. Bandel 2097
Thermoelectric Properties of Platinum-Rhodium Alloys. F. R. Caldwell 3866
Thermoelectric Powers. A. W. Foster 3867
Thermoelectric Researches on Solid Electrolytes. H. Reinhold and A. Blachny 3869
Electrical Conductivity of Zinc Oxide and Cadmium Oxide. H. H. v. Baumbach and C. Wagner 4213
Influence of Constitution of Cuprous Oxide on Electrical Properties. H. Dünwald and C. Wagner 4214
Thermoelectric and Volta Potentials of Cuprous Oxide. G. Mönch and S. Stechhöfer 4299
Transportation Heats in Electrolytic Peltier Heats. E. Lange and T. Hesse 4300
Thermo-E.M.F. and Ludwig-Soret Effect in Solid Salts and Mixed Crystals. H. Reinhold 4632
Hall Effect and Other Physical Constants of Alloys. Part I. Lead-Bismuth Series of Alloys. W. R. Thomas and E. J. Evans 4666
Correlation of Thermoelectric and Thermomagnetic Data. L. F. Bates 4708
Thermocouple Potentiometer. A. Egerton and A. R. Ubbelohde 5018

3. Unclassified.

Temperature Coefficient of Resistivity of Silicon and a Thermoelectric Phenomenon of Unipolar Substances. C. Bedel 723

Thermoelectricity, *continued*.

Abstract Nos.
Thermal Wattmeter. B. A. Sharpe 5094
Thermoelectric Measurement of Fluid Flow. A. Égal 5154

Time (Standards, Measurements, Apparatus).

1. Solar and Stellar Time.
2. Secondary Standards, Apparatus and Measurements.
3. Unclassified.

Cross-References :
Pendulums, *see also* Mechanics, Classical, 2.
Units, *see* Mathematical Methods, etc., 3.

1. Solar and Stellar Time.

Photographic Method of Recording the Angle of the Earth's Rotation by the Foucault Pendulum. Y. Okasaki 134
Apparent Lunar Effect in Time Determinations at Greenwich and Washington. A. L. Loomis and H. T. Stetson 3381
Method of Predicting Occultations for a Given Place. W. M. Browne 3406
Motion of the Moon, 1923-1931. E. W. Brown 3969
Greenwich Personality and the Equinox Correction. J. K. Fotheringham 3993
Year 1900 as Standard Equinox (Second Paper). E. C. Bower 5194

2. Secondary Standards, Apparatus and Measurements.

Automatic Time-Recorder. L. A. Richards and L. A. Wood 115
Quartz Clock for Time and Frequency Measurement of Very High Accuracy. A. Scheibe and U. Adelsberger 500
Isochronism of Pendulums. J. Haag 501
Recording the Falling Time of Bodies. R. M. Bowie 903
Influence of Tremors on Chronometer Rates. G. P. Arcay 1363
Free-Pendulum Clock. G. A. Tomlinson 1364
Time-Keeping—Old and New. F. Hope-Jones 1767
Theory of the Reduction of Acceleration Data. R. L. Edwards 2785
Performance of Relays. G. A. Tomlinson 3382
Clock Corrections from Photographic Zenith Tube Observations. F. B. Littell 3956
Quartz Clocks as Time-Keepers. A. Scheibe 3957
Schuler Pendulum. J. Weber 4382
Device for Accurately Timing Watches. G. P. Luckey 4384
Frequency and Behaviour of the Quartz Clock of the Physikalisch-Technische Reichsanstalt. A. Scheibe and U. Adelsberger 4793

3. Unclassified.

Effect of Tremors on the Rate of a Watch. J. Granier 904
Automatic Timing of the Ostwald Viscometer by Means of a Photoelectric Cell. G. Jones and S. K. Talley 3394
Applying Electric Fields for Short Intervals of Time. D. N. Nasledov, L. M. Nemenov and N. M. Reinov 4383
Atom as a Space-Time Quantum System. G. Beck 4385

Vacua, High.

1. Production.
2. Measurement.
3. Unclassified.

1. Production.

High-Speed High-Vacuum Diffusion Pumps. I. Estermann and H. T. Byck 502
Automatic Töpler Pump. A. T. Williamson 905
Section Velocity of Diffusion Pumps Driven by Organic Substances. H. Klumb and H. O. Glimm 1768
Mercury-Driven Water-Stream Pumps for High Vacua. G. Mönch and H. Sturm 1769
Vacuum-Valve. L. Wolf and S. v. Reichel 2245
Pumps. G. Mönch 2829
Improvement of Vacua by Electrical Discharges. W. v. Meyeren 4386
Clean-Up of Hydrogen by Magnesium. A. L. Reimann 4713

Vacua, High, *continued.*

2. Measurement.

Abstract Nos.

Measurements of Manometric Differences in Level. H. Klumb and T. Haase 66
Improved McLeod Gauge and Manometer. H. S. Booth 116
Vacuum Fats. W. Espe and I. Kroczek 414
Low Vapour-Pressure Gauge. K. Newbury and C. L. Utterback 672
Vapour Pressure of Vacuum Cements. R. M. Zabel 3119
Pirani Gauge. Y. Takamura 3958
Vacuum Measurements by Means of Hot Wires. H. Murmann 5187
Correction of Thermo-Molecular Flow. F. C. Tompkins and D. E. Wheeler 5188
See also 1768 *under* 1.

3. Unclassified.

Permeability of Quartz and Pyrex and Other Glass to Helium. J. C. McLennan and J. O. Wilhelm 1308

Vapour Pressure.

1. Observational:
   - (*a*) Saturated Vapour.
   - (*b*) Unsaturated Vapour.
2. Apparatus and Technique.
3. Unclassified.

Cross-References:
Hydrometers, *see* Meteorology, 7.
Rate of Evaporation, *see* Melting and Boiling Points, 5.
Theory, *see* Thermodynamics, 2 and 3.

1. Observational.

(*a*) *Saturated Vapour.*

Adsorption of Paraffin Vapours on Water: Significance of Traube's Rule. H. Cassel and M. Formstecher 1
Adsorption and Capillary Condensation. G. Lindau 6
Vapour-Pressure of Sodium. E. Thiele 307
Vapour Pressure of Water over Aqueous Solutions of Potassium Hydroxide. Y. Kobayashi 670
Densities of Saturated Vapours. R. Wright 671
Partial Pressure and Distribution Coefficient of Acetic Acid over its Aqueous Solution at 25° C. K. Fredenhagen and H. Liebster 1135
Distribution Coefficient of Hydrogen Fluoride over the Binary System (H_2O — HF) at 25° C and the Boiling Point Curve of the System at Atmospheric Pressure. K. Fredenhagen and Marianne Wellmann 1136
Vapour Pressure of Hydrogen Rich in its Heavy Isotope. W. Meissner and K. Steiner 1563
Distribution Coefficient of Hydrogen Cyanide and Water over the Binary System (H_2O-HCN) at 18° C. K. Fredenhagen and Marianne Wellmann 1564
System Ethyl Alcohol -*n*-Heptane at 30° C. J. B. Ferguson, M. Freed and A. C. Morris 1565
System Ammonia-Water at Temperatures up to 150° C and Pressures up to Twenty Atmospheres. I. L. Clifford and E. Hunter 1566
Vapour-Pressure Measurements of BaO, SrO, CaO and their Mixtures. A. Claassen and C. F. Veenemans 1567
X-Ray Study of the Changes in BaO-SrO Mixtures on Glowing. W. G. Burgers 1568
Method for Examination of Binary Liquid Mixtures. W. A. Wright 1968
Vapour Pressure of Crystalline Benzene and Cyclohexene. V. R. Deitz 1969
Vapour Pressure of Liquid and Solid Carbon Dioxide. C. H. Meyers and M. S. van Dusen 2503
Physical Properties of Di-Vinyl Ether. F. T. Miles and A. W. C. Menzies .. 3116
Influence of Intensive Desiccation on Physical Properties of Benzene. A. W. C. Menzies and D. A. Lacoss 3117
Vapour Pressure of Corrosive Substances. K. Arii 3118
Vapour Pressure of Cadmium Oxide. W. B. Hincke 3120
Vapour Pressure of Cæsium. J. H. de Boer and C. J. Dippel 3121
Determination of the Vapour Pressure of Amalgams by a Dynamic Method. J. S. Pedder and S. Barratt 3122
Empirical Formulæ for the Relation between the Temperature and Pressure of Saturated Vapour. A. Adamson 3710
Simple Method for Accurate Determination of Vapour Pressures of Solutions. D. A. Sinclair 3711
Vapours of Reciprocal Pairs of Salts and Binary Mixtures. B. Greiner and K. Jellinek 4173

Vapour Pressure, *continued.*

Abstract Nos.

Vapour Pressures and Activities of Binary Metallic Alloys. E. Burmeister and K. Jellinek 4174
Vapour Tension of BaO, SrO, and CaO and their Mixtures Deduced from Measurements of the Rates of Evaporation. E. Preston 4596
Formula for Specific Volumes of Saturated Vapours. C. H. Meyers 5372

(*b*) *Unsaturated Vapour.*

Refractivities of Binary Mixtures of Benzene. A. R. Martens and B. Collie .. 222
Thermochemical Constants of the Hexafluorides of Sulphur, Selenium and Tellurium. D. M. Yost and W. H. Claussen 2493
Vapour Pressure of Vacuum Cements. R. M. Zabel 3119
Action of Radon on Unsaturated Hydrocarbons. Part III. G. B. Heisig 3463
Thermodynamic Data for Metallic Sulphates. Parts I and II. F. Ishikawa and T. Murooka 3704
Volatilisation from Potassium Oxide-Silica Glasses. E. Preston and W. E. S. Turner 4580

2. Apparatus and Technique.

Low Vapour-Pressure Gauge. K. Newbury and C. L. Utterback 672
Method for Interpolating Data, Based on Dühring's Rule. J. H. Perry and E. R. Smith 1739
Molecular Weight of Substances in Solution in Liquid Ammonia at Room-Temperature. A. I. Schattenstein and A. M. Monossohn 3712
Glass-Wool Cell for Measuring Aqueous Vapour Pressure. N. E. Edlefsen 4594
See also 307, 671, 1563, 1968, 1969, 2503, 3117, 3118, 3122, 3711, 4173, 4174 *under* 1 (*a*); 3119 *under* 1 (*b*).

3. Unclassified.

Vapour Pressure Constant of Methane. T. E. Sterne 673
Sensitive Flames. H. Zickendraht 682
Production of Merget's Phenomenon by Arsonvalisation with Short Waves. H. Bordier 1569
Solid Carbon Dioxide from Flue Gas. F. E. E. Germann 1963
Vapour Pressure, Free Energy and Dissociation of Iodine Cyanide. D. M. Yost and W. E. Stone 3109
Surface Energy and Evaporation of Droplets. Dorothy J. Woodland and E. Mack, Jr. 4579
Chemical Potential of Salt Solutions. R. E. Gibson and L. H. Adams 4595
Lower Limit of the Particle Size in Disperse Systems. Gogoberidze 5120

Velocity of Light.

Cross-References:
Theory, *see* Radiation, General Theory; *also* Relativity and Ether.

Viscosity, Friction and Lubrication.

1. Theory.
2. Measurement of Viscosity.
3. Relations between Viscosity and Other Properties.
4. Lubrication.
5. Friction of Solids (Internal and External).
6. Apparatus and Technique.
7. Unclassified.

Cross-References:
Lubrication, *see also* Section B.—Electrical Engineering.
Viscosity of Colloids, *see* Colloids, 2*d* and 3*c*.

1. Theory.

Tension Double Refraction of Colloids in Solution. W. Kuhn 19
Viscosity of a Fluid Containing Small Drops of Another Fluid. G. I. Taylor .. 117
Viscosity of Strong Electrolytic Solutions According to Electrostatic Theory. H. Falkenhagen and E. L. Vernon 118
Ultrasonic Waves. P. Biquard 312
Rotary Oscillation of a Long Circular Cylinder in a Viscous Fluid. H. F. Winny 478
Viscosity of a Non-Wetting Fluid. M. Reiner and S. Erk 503
Nature of Coagulation Viscosity and Thixotropy in Colloidal Solutions. S. S. Kistler 826
Viscosity of Water. M. Golaz 1770
Vapour Viscosities and the Sutherland Equation. J. H. Arnold 1771
Mechanics of Gelation. E. G. Richardson 2116
Viscosity of Gases and Other Problems of Kinetic Theory. N. Gerasimov 2830
Viscosity of Homogeneous Fluids. R. O. Herzog and H. Kudar 3384

Viscosity, Friction and Lubrication, *continued.*

Abstract Nos.

Free Paths and Transport Phenomena in Gases and the Quantum Theory of Collisions. Part I. Rigid Sphere Model. H. S. W. Massey and C. B. O. Mohr 3940
Theory of Water and Ionic Solution, with Particular Reference to $\dot{H}$ and OH′ Ions. J. D. Bernal and R. H. Fowler 3951
Ellipsoidal Viscosity Distribution. W. S. Kimball 3959
Viscosity of Fused Salts and the Andrade-Sheppard Formula for the Viscosity of Liquids. B. Prasad 4387
Constants of Hagenbach's Correction to Poiseuille's Law. M. Lippke 4766
Representation of the Flow of Gases at Low Pressures by Means of Reynolds Numbers. H. Ebert 4767
See also 1772, 3385 *under* 2; 5189 *under* 3.

2. Measurement of Viscosity.

Effect of Magnetic Field on Viscosity of Oxygen. H. Engelhardt and H. Sack 119
Total and Specific Heats of a Series of Fractions of Petroleum, and their Relation to Other Properties. Parts IX to XII. H. R. Lang and R. Jessel 275
Supposed Allotropy of Liquid Nitrobenzene. E. Cohen and L. C. J. te Boekhorst 423
System Water-Phenol: Part II. Viscosities. O. R. Howell 906
Viscosity of Mixtures of Partially Miscible Liquids. Olive Oil-Water. R. Kremann, F. Griengl and H. Schreiner 1772
Conductivity Measurements in Nitro Compounds. Part I. Measurements in Nitromethane. Part II. Measurements in Nitrobenzene. P. Walden and E. J. Birr 2012
Plastic Properties of Asphaltic Bitumen. R. N. J. Saal and G. Koens 2175
Flow of Liquid Suspensions. E. G. Richardson and E. Tyler 2246
Effect of Small Water Additions upon the Conductivity of Electrolytes in Non-Aqueous Solvents. O. L. Hughes and H. Hartley 2560
Action of Ultra-Violet Radiation on Aqueous Solutions of Gelatin. P. Ponthus 2687
Viscosities of Acetaldehyde and Paraldehyde. W. H. Hatcher and C. T. Mason 2831
Hydrodynamic Resistance of Cylinders. K. Vogt and A. Becker 3327
Barostat. F. A. Gould and J. C. Evans 3383
Anomalous Viscosity of Segrating Systems. Part I. Structural Viscosity of Liquid Mixtures at the Critical Point (of Miscibility). Part II. Structural Viscosity of Mesomorphic Melts. W. Ostwald and H. Malss .. 3385
Viscosity of Barium Chloride in Aqueous Solution. G. R. Hood and L. P. Hohlfelder 3386
Viscosity of Urea in Aqueous Solution. G. R. Hood 3387
Viscosity of Optical Glass. W. H. Wadleigh 4491
Viscosity of Emulsions. E. G. Richardson 5117
Internal Friction of Liquid Systems of Limited Miscibility. M. Pestemer and M. Birkmann 5190
Anomalies in the Viscosity of Mineral Oils at Low Temperatures. Louis, Jordachescu and Thiebault 5191
Viscosity of Vapours of Organic Compounds. T. Titani 5192
See also 503, 1770, 1771 *under* 1; 1773, 3388 *under* 3; 3395, 4389, 4390 *under* 6.

3. Relations between Viscosity and Other Properties.

Lyotropic Numbers and Viscosity. E. H. Büchег, E. M. Bruins and J. H. C. Merckel 18
Experiments with Capillary Jets. E. Tylor and F. Watkin 464
Friction, Thermal Conductivity and Diffusion in Gaseous Mixtures. Parts XXI, XXII and XXIII. M. Trautz 643, 3079, 3080
Liquid Nitrobenzol Near the Melting Point. J. Wellm 650
Irreversible Processes in Electrolytes: Diffusion Conductance and Viscous Flow in Arbitrary Mixtures of Strong Electrolytes. L. Onsager and R. M. Fuoss 741
Viscosity and Molecular Weight. E. O. Kraemer and F. J. van Natta 823
Structural Viscosity of Lyophilic Sols. W. Gallay 832
Determination of Jelly-Strength and Modulus of Elasticity E_D of Glue Jellies and Influence of Additions on Viscosity and E_D. E. Goebel 1280
Kinetic Theory of Fluids. R. O. Herzog and H. C. Kudar 1327

Viscosity, Friction and Lubrication, *continued*.

Abstract Nos.
Dependence of Thermometer Lag on the Viscosity of the Indicating Liquid. W. Grundmann 1540
Viscosity of Aqueous Solutions as a Function of the Concentration. G. Jones and S. K. Talley 1773, 5193
Internal Friction in Coarse Disperse Systems. B. Iliin, T. Massillon and N. Zacharoff 2832
Influence of Slip on Viscosity of Suspensions. R. Eisenschitz 2833
Viscosity of Air, Argon and Hydrogen Chloride and Their Dependence on Temperature. J. R. Partington 2834
Viscosity of Gases at High Temperatures. P. Brémond 2835
Structural Viscosity and Elasticity in Molten Sulphur. W. Ostwald and H. Malss 3388
Fluidities and Associations of Alcohols and Esters of High Molecular Weight. E. C. Bingham and R. A. Stephens 3390
Conductivity of Mixtures of Acetic Acid with Various Amines. N. A. Puschin and P. S. Tutundžic 3771
Effect of Viscosity upon the Conductivity and Dielectric Constant of Electrolytes. O. Dobenecker 4638
Relations between Friction, Heat-Transition and Evaporation. W. Findeisen 4971
Fluidity Method for Determination of Association. E. C. Bingham and L. W. Spooner 5108
Viscosity of Solutions, in Particular of Solutions of Substances of High Molecular Weight. E. Guth and H. Mark 5189
See also 312, 478 *under* 1; 906, 2175 *under* 2; 4388 *under* 5.

4. Lubrication.

Adsorption. W. Hardy and Millicent Nottage 504
Physical Properties and Structure of Films of Lubricant. V. Vieweg 907
Boundary Lubrication by Soap Solutions. R. C. Williams 908
Beneficial Effect of Oxidation on the Lubricating Properties of Oil. R. O. King 2836
Theory of Film Lubrication. A. M. Robb 3391
Electrical Properties of Monomolecular Films on Liquids. H. G. Yamins and W. A. Zisman 4380

5. Friction of Solids (Internal and External).

Solid Viscosities of Metals. K. Sezawa and K. Kubo 868
Viscosity, Elasticity and Plastic Strength of Flour-Dough. R. K. Schofield and G. W. S. Blair 869, 2173, 3911
Nature of "Yield-Value." G. W. S. Blair 2172
Slow Rotation of an Anchor Ring in an Infinite Viscous Liquid. F. E. Relton 2189
Friction in Sands. G. I. Pokrowski 2837
Determination of Pore Distribution According to Dimensions in Filters and Ultra-Filters. F. Erbe 3309
Electromagnetic Measurement of Internal Friction. L. Polotowsky 3960
Skin Friction of Various Surfaces. S. D. Gehman and G. D. Mallory 4388
See also 504 *under* 4.

6. Apparatus and Technique.

Viscometer for Volatile and Hygroscopic Liquids. E. N. da C. Andrade and K. E. Spells 120
Binary Liquid Systems and the Mixture Rule. W. MacFarlane and R. Wright 1701
Excentric Descent of Spheres in Hollow Cylinders Containing Liquid or Gas. F. Höppler 2761
Inertia Law of Small Spheres in Frictional Media. E. Wasser 2762
Kinematic Viscosities and Times of Outflow of Commercial Viscometers. F. H. Garner and C. I. Kelly 2838
Simplest and Most Accurate Viscometer. L. Ubbelohde 3392
Correction in Viscometry by the Capillary-Tube Method. E. C. Bingham and J. A. Geddes 3393
Automatic Timing of the Ostwald Viscometer by Means of a Photoelectric Cell. G. Jones and S. K. Talley 3394
Measurement of Viscosity of a Molten Metal by Means of an Oscillating Disc. V. H. Stott 3395

Viscosity, Friction and Lubrication, *continued.*

Abstract Nos.

Viscous Resistance in Capillaries of Non-Uniform Radius. D. A. McLean 3961
Determination of Absolute Viscosity. J. R. Coe, Jr. 3962
Inertia Law of Small Spheres in Frictional Media. T. Sexl 4360
Measurement of Viscosity by Oscillating Columns. S. Venkataraman 4389
Measurement of Viscosities of Liquids Saturated with Gases at High Pressures. B. H. Sage 4390
See also 2116 *under* 1; 119, 2175, 2246, 3385, 4491 *under* 2; 1773, 5193 *under* 3; 4380 *under* 4; 3309, 3960 *under* 5.

7. Unclassified.

Viscosity of Gelatin under X-Rays. Helen Q. Woodard 121
Shape of Profiles of Liquid Films Draining on a Vertical Wetted Plate, and an Investigation of the Plate Ridge. J. Satterly and E. L. Stuckey 1356
Oil-Water Contact Surfaces. J. J. Trillat and L. Leprince-Ringuet 3374

Vision.

1. Theories of Vision.
2. Phenomena of Vision.
3. Optics of the Eye.

Cross-References:
Measurement of Colour, *see* Colorimetry, 2.
Visibility, *see also* Meteorology, 6.

1. Theories of Vision.

Emanation Content of the Atmosphere, Meteorological Factors and Cosmic Radiation. W. Messerschmidt 2340
Binocular Oscillation and Fusion of Colours. J. F. Allen 3051
Visual Reception. J. Guild 3611
Weber-Fechner Law. R. A. Houstoun 3612
Theory of Brightness-Constancy and General Theory of Vision. K. Koffka .. 3613
Sensation of Light as a Photochemical Process. D. Roaf 3614
Interpretation of Quantative Data in Visual Problems. J. Guild 3615
Problems of Vision. J. Parsons 3616
Trichromatic Theory and its Explanatory Power. F. Allen 3617
Essence and Present Position of the Trichromatic Theory. W. Peddie 3618
Colour-Vision. H. Hartridge 3619
Quantative Formulation of Colour-Vision. S. Hecht 3626

2. Phenomena of Vision.

Photoelectric Visibility Measurements. Part II. L. W. Pollak and W. Gerlich 1090
Observations with the Eye of a Schrot Effect for Photons. R. B. Barnes and M. Czerny 1091
Accommodation, Pupillary Width and Stimulus Distance. E. Freeman 1092
Sensibility to Colour Temperature. Change as a Function of Temperature. D. B. Judd 1917
Chromaticity Sensibility to Wave-Length Difference as a Function of Purity. E. P. T. Tyndall 1918
Dependence of Visual Acuity upon Stimulus-Distance. M. Luckiesh and F. K. Moss 1919
Photometry and Acuteness of Vision. G. Holst 2376
Visibility of Objects Illuminated by a Projector. Part II. Y. Rocard. Part III. J. Rivière and Y. Rocard. Part III (continued). J. Rivière and Y. Rocard 3052, 4127, 4955
Visibility of the Ultra-Violet down to a Wave-Length of 3130 Å. J. Saidman 3053
Visual Acuity and Sodium Light. M. Luckiesh and F. K. Moss 3054
Sensitiveness of the Eye to Differences in the Saturation of Colours. L. C. Martin, F. L. Warburton and W. J. Morgan 3620
Measurability of Sensations of Hue, Brightness or Saturation. L. F. Richardson 3621
Measurement of Visual Sensations. N. R. Campbell 3622
Fundamental Colours and the Colour Triangle. J. Drever 3623
Colour Triangle and Colour Discrimination. T. Smith 3624
Influence of Intensity, Colour and Retinal Location on the Fusion Frequency of Intermittent Illumination. S. Hecht and C. D. Verrijp 3625
Significance of Colour-Fatigue Measurements. W. D. Wright 3627
Laws of Establishment of the Chroma. H. Pieron 3628
Equivalent Adaptation Levels in Localised Retinal Areas. W. S. Stiles and B. H. Crawford 3629

Vision, *continued.*

Abstract Nos.

Retinal Action Time. H. Banister 3630
Physiological Significance of the Retinal Synapses. R. Granit 3631
Properties of Receiving-Organs in the Retina. H. E. Roaf 3632
Visual Acuity and Retinal Structure. R. S. Creed 3633
Visual Acuity and Resolving-Power of the Eye. H. Hartridge 3634
Dark Adaptation of the Human Eye. A. Brückner 3635
Recent Views on Accommodation. A. v. Pflugk 3636
Mechanism of Accommodation and the Recession of the Near Point. E. F. Fincham 3637
Visual Perception of Depth. F. C. Bartlett 3638
Refractive Conditions for the Peripheral Field of Vision. C. E. Ferree and G. Rand 3639
Conditions for Kinematograph Projection. J. Marette 4061
Precision of Visual Photometry. Y. le Grand 4065
Visibility of Objects in a Searchlight Beam. W. M. Hampton 4545
Effect of Intensity of Illumination on the Near Point of Vision and a Comparison of the Effect for Presbyopic and Non-Presbyopic Eyes. C. E. Ferree and G. Rand 4546
Visibility of Light Signals by Day. E. Stoecker 4954
Complementary Colour Relations. E. Genberg 5347
Neutral Value Scales. Part I. Munsell Neutral Value Scale. A. E. O. Munsell, L. L. Sloan and I. H. Godlove 5348
See also 3619 *under* 1 ; 262, 1093, 1094, 4547 *under* 3.

3. Optics of the Eye.

Corresponding Retinal Points, the Horopter and Size and Shape of Ocular Images. A. Ames, Jr., K. N. Ogle and G. H. Gliddon 262, 1093
Magnification by Corrective Lenses. R. Petit 263
Analytical Treatment of the Longitudinal Horopter ; Its Measurement and Application to Related Phenomena, Especially to the Relative Size and Shape of the Ocular Images. K. N. Ogle 1094
Modified Broca Pupillometer. F. K. Moss 1095
Accommodative Effort of Corrected Ametropes. E. Haas 1920
Subjective Tests for Astigmatism. D. F. Roessler 3640
New Optical Experiment and Use of Single Lens for High Magnification ; Observation of Entoptic and Diffraction Phenomena. J. G. Winans 4080
Accuracy of Refraction Measurements of the Eye. A. Kühl 4128
Influence of Chromatic Aberration of the Eye on Visual Acuity. W. de Groot and G. Holst 4547
See also 3053 *under* 2.

X-Rays.

1. Methods of Production, Apparatus and Instruments for ; Phenomena of the X-Ray Tube.
2. Scattering, including Compton Effect.
3. Absorption and Ionisation.
4. Chemical and Photographic Action.
5. Reflection and Refraction.
6. Line Spectra Emission.
7. Continuous Spectra, Emission.
8. Absorption Spectra.
9. Diffraction.
10. Measurements of Intensity, Equality, Wave-Length, etc.
11. Applications (Industrial Radiography, and Chemical Analysis).
12. Apparatus for X-Ray Spectroscopy.
13. Unclassified.

Cross-References :
Constitution of Atoms and Molecules, *see* Atomic and Molecular Structure.
Photoelectric Emission by X-Rays, *see* Photoelectricity, 1 and 2.
Polarisation of X-Rays, *see under* Polarisation (Radiation), 3.
Radiography (Medical) and Radiotherapy, *see* Medical Radiology and Electrology.
Structure of Crystals, *see* Crystal Structure and Properties.

1. Methods of Production, Apparatus and Instruments for ; Phenomena of the X-Ray Tube.

Hot-Kathode X-Ray Tubes for Steady Running. W. R. Harper 264
Metal X-Ray Tube for Characteristic Radiation. C. J. Ksanda 265
Powerful Kathode-Ray Tube. Y. Cauchois 1165
Monochromatic X-Rays. H. Küstner 1523
3000-kV Impulse Generator. T. E. Allibone, F. S. Edwards and D. B. McKenzie 2076
H. T. Porcelain X-Ray Tube. R. Crane and C. C. Lauritsen 2453
Operation of Thick-Walled X-Ray Tubes on Rectified Potentials. L. S. Taylor and C. F. Stoneburner 2637

X-Rays, *continued.*

Abstract Nos.
H.T. Generators for X-Ray Apparatus. E. H. W. Banner........ 3641
Comparison of H.T. X-Ray Generators. L. S. Taylor and K. L. Tucker........ 3642
Emission of a Very Soft Radiation by Electrified Insulators. G. Reboul........ 4129
Spectrographic Investigation of the Radiation from Semi-Conducting Cells. G. Déchène........ 4130
Demountable X-Ray Tube. E. P. Miller........ 4131
Calcium Target for X-Ray Tubes. H. Kersten and J. Maas........ 4132
Convergent X-Ray. K. Fritz........ 4133
Excitation of X-Rays by Collision of High-Velocity Positive Ions. K. Lion........ 4199
Doppler Effect in Hydrogen at High Voltages. K. Lion........ 4200
Combined Tesla Coil and Vacuum Tube. C. C. Lauritsen and R. Crane........ 4623
Comparison of X-Rays Generated by Voltages of Different Wave-Form. L. S. Taylor, G. Singer and C. F. Stoneburner........ 4956
Comparison of H.T. X-Ray Tubes. L. S. Taylor, G. Singer and C. F. Stoneburner........ 4957
Direct Measurement of X-Ray Tube Voltage. F. D. Owen-King........ 4958
Progress in the Design and Manufacture of X-Ray Tubes. M. J. Gross and Z. J. Atlee........ 5349
See also 4550 *under* 3; 3652, 4556 *under* 6.

2. Scattering, including Compton Effect.

Atom-Factors. W. Ehrenberg and K. Schäfer........ 266
Numerical Values of Atomic Constants and X-Ray Terms. H. R. Robinson........ 267
Scattering of X-Rays in Chlorine. H. Richter........ 268
Scattering of Hard X-Rays by Solids. S. Chylinski........ 269
Influence of Temperature on the Scattering of X-Rays by Gas-Molecules. R. W. James........ 270
Use of Monochromatic Radiation in X-Ray Scattering by Gases. W. van der Grinten........ 271
Extension of Woo's Formula. Intensity of the Light Diffused by an Electron in Motion. C. Cannata........ 570
Scattering of X-Rays by Gases and Crystals. G. E. M. Jauncey........ 1096
Multiple Compton Diffusion. H. Hulubei........ 1097
X-Ray Scattering Power of Metallic Silver for Copper *Ka* Radiation. L. Chrobak........ 1921
Atomic Scattering Factor for X-Rays in the Region of Anomalous Dispersion. D. Coster and K. S. Knol........ 1922
X-Ray Investigation of Atomic and Molecular Structure. J. Weigle........ 2107
Linear Momenta of Electrons in Atoms and in Solid Bodies as Revealed by X-Ray Scattering. J. W. M. DuMond........ 2454
Conservation of Energy and Momentum in the Photoelectric Effect. J. Kunz 2654
Scattering of X-Ray from Powdered Crystals. G. E. M. Jauncey and F. Pennell........ 3055
Diffuse Scattering of X-Rays from Sylvine. Parts II, III and IV. G. G. Harvey........ 3056, 3057, 4134
Raman Effect in the Sphere of X-Rays. W. Kast and F. Würstlin........ 3607
Anomalous Scattering of X-Rays by Copper. A. A. Rusterholz........ 3643
Effect of Temperature on the Intensity of X-Rays Scattered by Powdered Sodium Fluoride. J. J. Shonka........ 3644
Measurement of Intensity of Compton Modified Radiation by Means of Filters. E. O. Wollan........ 3645
Diffraction of X-Rays by Liquid Sulphur. A. H. Blatchford........ 3646
Scattering of X-Rays from Powdered Crystals at Low Temperatures. G. E. M. Jauncey and F. Pennell........ 4135
High-Temperature X-Ray Camera for Precision Measurements. A. H. Jay........ 4340
Influence of Temperature on the Scattering of X-Rays by CCl_4. W. van der Grinten........ 4548
Determination of J-Discontinuity by a Condition of Matter. C. G. Barkla and J. S. Kay........ 4549
See also 2456 *under* 3; 3064 *under* 5; 1104 *under* 6.

3. Absorption and Ionisation.

Viscosity of Gelatin under X-Rays. Helen Q. Woodard........ 121
Absorption Coefficient for X-Rays near L-Edges of Pt and Au. M. Wolf........ 272
Magnitudes of the L-Absorption Discontinuities of Gold. F. M. Uber and C. G. Patten........ 273

X-Rays, ***continued.***

Abstract Nos.

Absorption and Dispersion of Celluloid between 300 and 1000 Å. H. M. O'Bryan 995
Modification of X-Rays by Passage through Matter. S. Bhargava and J. B. Mukherjee 1098
X-Ray Diffraction in Ethyl Ether Near the Critical Point. F. H. W. Noll.... 1099
Proposed Unit for Ionisation Intensities in Gases. W. Kolhörster.......... 1162
Measurement of X-Ray Absorption Coefficients by the Use of the FP-54 Pliotron. L. M. Heil and J. E. Edwards 1524
Absorption Curves and Spectra of X-Ray Beams. A. Mutscheller.......... 1525
Atomic Radius of Carbon in Diamond. V. Posejpal 1671, 3292
Theory of the Dispersion and Absorption of Helium. J. A. Wheeler.......... 1877
Efficiency of Production of Fluorescent K-Radiations from Light Elements. M. Haas 2455
Relative Ionisation in Air, Nitrogen, Oxygen and Argon for CuK_{α} Radiation. O. Gaertner 2456
Classical Distribution of Electrons Due to Photoelectric Absorption of X-Rays. J. Kunz 2655
Coefficients of Absorption of X-Rays in the Neighbourhood of L-Edges. M. Wolf 3058
Structure of the X-Ray K-Absorption Limits of the Elements Mn to Zn. A. H. Barnes 4136
Ionisation of Rare Gases by X-Rays. E. Wilhelmy.......... 4137
Passage of Photons Through Atoms. V. Trkal and F. Záviska 4138
Magnitude of the L-Absorption Discontinuities. I. Backhurst.......... 4550
Absorptions of Ultra-Soft X-Rays. J. A. Prins and A. J. Takens.......... 4551
X-Ray Absorption Edges of Titanium in Titanium Compounds and the Constitution of Ilmenite. L. v. Hámos and W. Stscherbina 4552
Ionisation of Light Gases by X-Rays. Parts I and II. W. R. Harper.......... 4553
Influence of Chemical Combination on Absorption of Coefficients of Light Elements for Long Wave-Length X-Rays. R. H. Messner.......... 5350
See also 4549 *under* 2; 4146 *under* 10.

4. Chemical and Photographic Action.

Application of Blair-Leighton Equation to X-Rays. J. A. Lester and J. M. Blair 1451
Photochemical Reactions of Monoalkyl Malonic Acids. D. Coster and A. van der Ziel 2366
Influence of Temperature on the Röntgenisation of Rock-Salt. C. Sinelnikow, A. Walther, I. Kurtschatow and S. Litwinenko.......... 3059
Reduction of Chromatic Solutions by X-Rays. H. Fricke and E. R. Brownscombe 3647
Topography of the Latent X-Ray Image. Lüppo-Cramer and H. Steps 4139
Formation of Silver in Photographic Layers under the Influence of X-Rays. P. Günther and H. Tittel 4140
New Fluorescent Screen for Visual Examinations. L. Levy and D. W. West.. 4274
Solarisation of Glass by Soft X-Rays. H. Kersten and C. H. Dwight 4554
Photographic Effect of X-Rays. G. W. Brindley and F. W. Spiers 4959
See also 1525 *under* 3.

5. Reflection and Refraction.

Electron Interference and Röntgen Interference. F. Kirchner 1191
X-Ray Study of Phase Boundaries in Thermal Diagrams of Alloy Systems—Cu-Zn System. E. A. Owen and L. Pickup 2137
Effect of Strain on Intensity of X-Ray Reflection. E. Fukusima 3060
Total Reflection of X-Rays by Liquids. H. Steps 3061
Total Reflection of X-Rays by Thin Layers. A. I. Alichanow and L. A. Arzimovič 3062
Absolute X-Ray Reflectivities of Single Crystals of Calcite, Rock-Salt, Rochelle Salt and Barite. P. Kirkpatrick and P. A. Ross 3063
Reflection and Refraction of X-Rays by Perfect Crystals. G. W. Brindley.... 3064
Intensity of X-Ray Reflection. F. C. Blake 4141
Theory of Dispersion of X-Rays. H. Hönl.......... 4142
Accurate Determination of the Refractive Index of X-Rays. S. Hertzrücken and K. Kotlarewskaja 4555
Reflection of X-Rays by Absorbing Crystals. M. Kohler 5351
Reflection of X-Rays from Anthracene Crystals. B. W. Robinson 5352

X-Rays, *continued.*

Abstract Nos.

Refraction of X-Rays by Glass. G. Orbán 5353
See also 1921, 1922 *under* 2.

6. Line Spectra, Emission.

X-Ray Emission Spectrum and Chemical Combination. Part I. Fluorescence Excitation of the $K\alpha_1\ \alpha_2$ Doublet of Sulphur. Part II. Investigations on the $K\alpha_1\alpha_2$ Doublet of Chlorine. O. Lundquist 638, 3653
Influence of Lattice Combination on the $K\alpha$-Line of Carbon. M. Renninger .. 639
Intensity Relations in the L Regions of the Rare Earths. G. v. Hevesy and E. Alexander 1100
N-Series of the Elements 73Ta-81Tl. Part I. T. Magnusson 1101
X-Ray Spectra and Lattice Binding. R. Glocker 1102
Fine Structure of $K\alpha$ of Carbon. M. Morand and A. Hautot 1103
Measurement of X-Ray Emission Wave-lengths by Means of the Ruled Grating. R. B. Witmer and J. M. Cork 1104
Interpretation of X-Ray Term Values. M. N. Saha and R. S. Sharma 1105
Effect of Particle Size upon Intensity in X-Ray Spectroscopic Analysis. G. R. Fonda 1526
Wave-Lengths of the $K\alpha_1$-Lines of Various Elements. J. A. Bearden 1923
M-Series of Tantalum Obtained by Means of an Ionic Tube. V. Dolejšek and (Miss) E. Filčáková 1924
X-Ray Satellites. H. C. Wolfe 1925
Weak Lines of the K-Spectra of 42 Mo and 47 Ag. E. Carlsson 1926
Corpuscular X-Ray Spectra of the Radio-Elements. C. D. Ellis 1927
γ-Ray and X-Ray Spectra of the Thorium Family. M. Valadares 2328
M-Levels of Magnetised Iron. Privault 2457
Effect of Lattice Distortion and Fine Grain on the X-Ray Spectra of Metals. W. A. Wood 2459
Structure of Some Ultra-Soft X-Ray Lines. J. A. Prins 3065
K-Series Spectrum of Tungsten. J. C. Hudson and H. G. Vogt 3066
Dependence of the K-Lines of Elements from Cu to Ti on Chemical Combinations. S. Yoshida 3067
Chemical Combination and X-Ray Emission Spectrum of Sulphur. J. Valasek 3068
Intensity of Spectral Lines of X-Rays from Tungsten. L. Pincherle 3069
Relation Between Line and Continuous X-Ray Spectra. W. W. Hansen and K. B. Stoddard 3070
Excitation Potentials of Beryllium. H. W. B. Skinner 3144
Weak Lines in the K-Spectra of the Elements Rh 45 and Mo 42. H. Hulubei and (Miss) Y. Cauchois 3648
X-Ray Emission Spectra of Gaseous Elements: K-Spectrum of Krypton. K-Spectrum of Xenon (Emission and Absorption). Weak Lines in the K-Spectrum of Krypton. (Miss) Y. Cauchois and H. Hulubei .. 3649, 5355, 5356
Structure of K-Lines of Light Elements. A. Hautot 3650
Structure of K-Spectra of Very Light Atoms. A. Hautot 3651
Probabilities of K-Electron Ionisation of Silver. D. L. Webster, W. W. Hansen and F. B. Duveneck 3652
γ-Ray and X-Ray Spectra of the Radium Family. M. Valadares 4035
Natural Widths of the $K\alpha$ X-Ray Doublet from 26 Fe to 47 Ag. S. K. Allison 4143
M-Levels of Magnetised Iron. Privault 4144
Stimulation of X-Radiation by Canal-Ray Impacts. C. Gerthsen and W. Reusse
X-Ray Line Intensities and Kathode-Ray Retardation in Thick Targets of Silver. D. L. Webster, W. W. Hansen and F. B. Duveneck 4556
Excitation of X-Ray Lines of the Second Kind. D. Coster and W. J. Thijssen 4557
Studies in the Extreme Ultra-Violet and the Very Soft X-Ray Region. Siegbahn 4559
Structure of K-Radiation from N, C, B and Be. M. Morand and A. Hautot 4560
Weak L-Lines of 79 Au and 74 W. H. Claësson 4960
Quadripolar Radiation. L. Pincherle 5354
X-Ray Satellites of High Atomic Number Elements. F. K. Richtmyer and S. Kaufman 5357
Soft X-Rays from (100) and (111) Faces of Copper Single Crystals. M. L. Williams 5358
Widths and Shapes of the $K\alpha$ X-Ray Doublet from Ca (20) to Ni (28). L. G. Parratt 5359
See also 3058 *under* 3; 2366 *under* 4; 1928, 4558 *under* 10; 2463, 3072, 4563, 4564 *under* 12.

X-Rays, *continued.*

7. Continuous Spectra, Emission.

Abstract Nos.
L X-Ray Spectrum of Solid Aluminium. T. H. Osgood 4961
See also 4130 *under* 1; 2328, 3068, 3070 *under* 6; 1928 *under* 10.

8. Absorption Spectra.

K-Absorption Edges of Ni, Cu, Zn and their Compounds. M. Ishino and K. Kojima 1106
Fine Structure of X-Ray Absorption Spectra. J. D. Hanawalt 1107
X-Ray Absorption Spectra of Chlorine Compounds in Aqueous Solution. O. Stelling 1108
Theory of X-Ray Absorption in Molecular Gases. Part II. H. Petersen 1527
Influence on the Accuracy of Measurements of Band Heads by Errors in Developing Spectrogram Photographs (Fringe Effect). H. Seeman 1915
Fine Structure of X-Ray Absorption Boundaries. J. Veldkamp 3654
Fine Structure in the K X-Ray Absorption Spectrum of Bromine. S. T. Stephenson 4561
See also 4549 *under* 2; 3058 *under* 3; 2328, 3067, 3068, 5355 *under* 6.

9. Diffraction.

Investigation of the Dielectric Properties of Rochelle Salt by Means of X-Rays. H. Staub 3178
Formula for Diffraction by a Perfect Grating. C. Eckart 3655
See also 4559 *under* 6; 1530, 1531 *under* 12.

10. Measurements of Intensity, Equality, Wave-Length, etc.

Design of Pressure Ionisation Chambers. J. H. Williams 714
Absolute Measurement of X-Ray Intensity. V. Loeck 1109
Measurement of X-Ray Intensities as Functions of Voltage, up to 180 kV. D. L. Webster, W. W. Hansen and F. B. Duveneck 1110
Relative Intensities of the $L\alpha_1$, β_1, β_2, and γ_1 Lines in Tantalum, Tungsten, Iridium and Platinum. V. J. Andrew 1111
X-Ray Machine Outputs and Influence of Wave-Form on Quality of X-Radiation. C. E. Eddy 1219
Measurement of L.T. X-Ray Intensities. L. S. Taylor and C. F. Stoneburner 1220
X-Ray Tube Input Control. W. R. Harper 1528
Spectral Composition of X-Radiation from Filtration Curve. L. Silberstein 1928
International Comparison of the Röntgen—The Unit of Quantity of X-Rays. G. W. C. Kaye and W. Binks 2648
Measurements of High-Voltage X-Rays. W. V. Mayneord and J. E. Roberts 3656
Relative Intensities and Transition Probabilities of the K-Series Lines of the Elements 24 to 52 by the Ionisation Chamber Method. J. H. Williams 4146
Wave-Length Determination in the Very Soft X-Ray Region. F. C. and L. P. Chalklin 4558
Recording Photodensitometer for X-Ray Photographs. W. O. Milligan 4562
X-Ray Shutter with a Simple Timing Device. W. Binks 5086
Experimental Realisation of the Röntgen. G. W. C. Kaye and W. Binks 5087
See also 1523, 4956, 4957 *under* 1; 1921, 3055, 3644, 3645, 4548 *under* 2; 3060 *under* 5; 639, 1104, 1526, 1923, 3068, 3652, 4145, 4556, 5354 *under* 6; 1106 *under* 8; 4564, 4567 *under* 12.

11. Applications (Industrial Radiography and Chemical Analysis).

X-Ray Study of the Electrolytic Fe-Ni Alloys. K. Iwasé and N. Nasu 27
Correction for Debye-Scherrer X-Ray Photographs. Z. Nishiyama 444
Structure of Interference Lines in the Powder Method. I. Levin and E. Ott 858
X-Ray Studies on the Hydrous Oxides. Part I. Alumina. Part II. Stannic Oxide. Part III. Stannous Oxide. H. B. Weiser and W. O. Milligan 1112
X-Ray Study of Ferrous Oxide Solid Solutions. E. R. Jette and F. Foote 1529
Application of Radiography in Relation to Paintings. L. van Puyvelde 2460
Quantitative Chemical Analysis by Means of X-Rays. F. Voges 2461
Velocity of Diffusion of Metals in Gold and Silver. W. Jost 2723
Future of Technical Radiology. C. N. Kemp 3071
X-Ray Measurement of Strain. H. Möller 3657
X-Ray Detection of Lattice Distortion. B. Pfarr 3658
X-Ray Investigations on the Thermal Expansion of Solids. Part I. G. Shinoda 3672

For the Key to this Index see pp. 1358 to 1372.

X-Rays, *continued*.

Abstract Nos.

Thermal Expansion of Quartz by X-Ray Measurements. A. H. Jay........ 4969

See also 4133 *under* 1; 4552 *under* 3; 3059 *under* 4; 638, 1526, 3653 *under* 6.

12. Apparatus for X-Ray Spectroscopy.

X-Ray Apparatus for Investigation of Microscopic Crystals. O. Kratky and K. Eckling........ 442

Preparing Crystals for Rotation Photographs. H. Kersten and W. Lange .. 855

Self-Rectifying Demountable X-Ray Tube of High Power. C. E. Eddy.... 1113

Preparation of Collodion Filters for X-Rays. H. Kersten and J. Maas...... 1301

Correction of Errors of X-Ray Spectrometers. H. Seeman........ 1530

Correction of Errors of X-Ray Spectrometers. M. Siegbahn........ 1531

Investigation of the Gaseous Decomposition Products of X-Ray Films. Grace Ballard........ 1649

Emission and Absorption Spectra with Bent Crystals as Transmission Gratings. A. Sandström and E. Carlsson........ 1929

Kinematographic Study of the Discharge through Discharge Tubes. V. Dolejšek and K. Dráb........ 2003

Ultra-Sensitive H.T. Electrostatic Indicating Voltmeter. W. R. Harper.... 2053

Simple Universal Camera for X-Ray Analysis. E. Sauter........ 2156

Effect of Etching on the Relative Intensities of the Components of Double Laue Spots Obtained from a Quartz Crystal. M. Y. Colby and S. Harris 2157

Spectrography of X-Rays Using a Divergent Beam. Y. Cauchois........ 2462

Large Grazing-Incidence Vacuum Spectrograph. P. G. Kruger........ 2463

New Focussing X-Ray Spectrometer. T. Johansson........ 3072

Application of the Electrometer Triode to the Measurement of Ionisation Current. J. A. C. Teegan and A. M. Hayes........ 3156

Electrometer Triode in the X-Ray Ionisation Spectrometer. W. A. Wooster and B. W. Robinson........ 3157

Quartz as a Standard for Accurate Lattice-Spacing Measurements. A. J. Bradley and A. H. Jay........ 3305

Reinforcement-Screens in X-Ray Spectroscopy. G. Küpferle........ 3659

Moving Film Cameras in X-Ray Analysis. B. W. Robinson........ 3660

X-Ray Photography of Powders at Liquid-Air Temperature. J. A. Santos and J. West........ 3661

Constant Deviation X-Ray Vacuum Monochromator. G. I. Harper........ 4147

Integrating Photometer for X-Ray Crystal Analysis. B. W. Robinson...... 4148

Amplification of D.C. with a Tetrode. P. Donzelot and J. Divoux........ 4222

L-Series of Molybdenum and Silver. P. Haglund........ 4563

Weak Lines in K-Spectra. E. Carlsson........ 4564

Bending of Crystals and Focussing Effect in X-Ray Spectroscopy. E. Carlsson........ 4565

X-Ray Spectroscopy with Curved Crystalline Reflectors. L. v. Hámos...... 4566

High Vacuum Spectrograph for Chemical Analysis with X-Rays. E. Alexander........ 4567

High Vacuum X-Ray Spectrometer. A. Sandström........ 4568

Interferometric Examination of Cleavage Faces of Crystals. M. Siegbahn 5130

Inherent Limitation of Soller (Multiple) Slits. T. N. White........ 5133

See also 4132 *under* 1; 1524, 4552 *under* 3; 3063 *under* 5; 638, 1923, 1924, 3068, 3653 *under* 6; 1109, 1110, 1111, 4146, 4558 *under* 10.

13. Unclassified.

Filter for X-Ray Power Supply. J. B. Hoag and V. J. Andrew........ 1114

Influence of X-Rays upon the Formation of Crystal Nuclei. D. Samuiacas.. 1695

Efficiency of Secondary Electron Emission. S. R. Rao........ 2046

Effect of X-Rays on Rectifier Photoelectric Cells. K. Scharf and O. Weinbaum 2084

Testing the Polarisation of the K-Radiation of the X-Ray Fluorescence of Anisotropic Single Crystals. M. Groos........ 2356

Quadripole Lines in X-Ray Spectra. E. Segrè........ 2458

Temporary Activation of Geiger-Müller Counters after Treatment with X-Rays. R. Brunetti and Z. Ollano........ 3153

Zodiacal Light and Gegenschein.

Investigations of the Auroral Spectrum during 1921–1926. L. Vegard...... 970

Photometry of the Gegenschein. C. T. Elvey........ 1381

Auroral Spectrograph and the Upper Atmosphere. L. Vegard........ 5232

For the **Key** to this Index see pp. 1358 to 1372.